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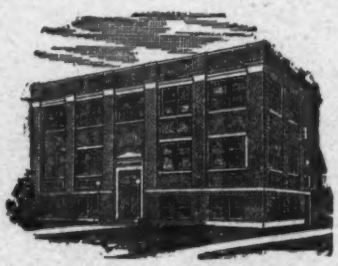

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JAUNDICE AND ITS SURGICAL SIGNIFICANCE[1]

BY C. H. MAYO, M.D., F.A.C.S., ROCHESTER, MINNESOTA

JAUNDICE as a symptom of disease may present a very serious problem in tracing its cause. In approximately 50 per cent of the cases seen the absorption of bile is due to obstruction of the common duct by gall-stone; in 20 per cent of all cases it is due to absorption of bile in the liver, or infective or catarrhal jaundice without duct obstruction. Most of the latter cases occur in children and young persons, just enough occurring in middle age and later to make a differential diagnosis necessary, as attacks of pain sometimes accompany this infectious disease or the patients actually have gall bladder disease.

It is not my intention to discuss the diagnosis of the various causes of jaundice, but to consider the treatment of obstructive jaundice in cases in which the patient is on the table, the abdomen is open, and jaundice is either present, or the patient is having a free interval between recurring attacks. The surgeon must have in mind the fact that jaundice is an essential feature of several conditions, and that it is an indication of serious disease in the majority of cases. The idea that jaundice may be a symptom in fairly normal persons over long periods evidently came about from the observation of hæmolytic acholuric jaundice caused by splenomegaly, a surgically curable disease, sometimes complicated with gall-bladder disease and stones. From 5 to 8 per cent of the cases of jaundice are due to serious infection of the gall-bladder, possibly gangrene, with or without stones; they are usually accompanied by a degree of pancreatitis with marked swelling of the lymph glands on the three ducts; all persons have one on each duct, but no one more than two. The liver is congested and dark; the ducts are slightly enlarged and contain much flocculent material which is also found in the gall-bladder in which stones are usually present.

Jaundice from cancer presents a very serious problem, although it represents but 15 per cent of the cases seen; one-half of these are from cancer of the liver, the other half from cancer of the pancreas, or the gall-bladder, and ducts. Patients with cancer of the pancreas or in the ampulla of Vater may be relieved, often for many months, by short-circuiting the obstructed area. We have not had a permanent cure from transduodenal extirpation of tumor of the ampulla; and it must be admitted also that it is sometimes difficult positively to determine whether the hardening of the pancreas causing obstructive jaundice is of a malignant or of an inflammatory nature. Jaundice from cirrhosis, with ascites usually present, occurs in about 8 per cent of cases. The old classification made by Courvoisier still remains a true observation, in which in about 84 per cent of the cases of stone in the common duct the gall-bladder was shrunken or atrophied; while in 92 of 100 cases of obstruction due to

[1]Presented before the Western Surgical Society, Kansas City, Missouri, December, 1919.

lesions in the ampulla or pancreas or other conditions, the gall-bladder was dilated or enlarged; in the remaining 8 cases it was either normal or atrophic.

In cases of chronic jaundice with obstruction the distended gall-bladder and ducts are often filled with a clear mucoid fluid, indicating, I believe, that the power of the mucous gland to secrete the less absorbable mucus which fills the ducts is greater than the power of the liver to secrete bile, and forces the liver with its lower blood pressure to absorb the bile. In cases of late operation at which the so-called white bile is found, failure of the power of biliary excretion to appear within a day or two following the operative drainage is a most unfavorable symptom. Long continued jaundice slows the coagulation time of blood; as a rule if the coagulation time is under 10 minutes it is not of serious moment, but a 10 to 25 minute period is not uncommon, and in some cases the blood will not coagulate in an hour. Patients in whom the blood leaves the vessels as shown by numerous subcutaneous hæmorrhages should be medical cases until improvement occurs before surgery is indicated. Calcium has been given, with questionable relief, to reduce the delayed coagulation time of patients with chronic jaundice who are being prepared for operation. The best measure in cases with 12 minutes or more coagulation time is the transfusion of acceptable human blood. Patients whose coagulation time is greatly reduced are given one transfusion and the blood is tested the next day. If improvement is marked operation is performed, but if improvement is slight transfusion is repeated just preceding the operation, and, if there is hæmorrhage during the next few days transfusion is again repeated with occasional benefit.

If the gall-bladder shows marked evidence of disease, especially in cases of stone in the common duct, a cholecystectomy is performed. After removal of the gall-bladder the cystic duct is split through into the common duct to permit of an exploration; here the pliable metal spoons and bulb-tipped probes, and the Gusse fenestrated stone forceps of various sizes are useful. In the rare instances in which the gall-bladder has already been removed a more favorable location than the cystic duct area can be selected. In more severe infection with degrees of gangrene, the gall-bladder should be removed unless the serious condition of the patient makes haste imperative; then it is drained with or without drainage of the common duct, depending on whether or not bile flows from the gall-bladder.

In such cases the gall-bladder is split on each side with scissors from top to bottom, one-quarter of an inch from its attachment to the liver. The free flap is turned downward, exposing the obstructing stone in the cystic duct; the duct is clamped in forceps and divided. The mucous membrane remaining on the liver attachment readily peels off, leaving the outer layer of the gall-bladder for protection since if this should be peeled off serious hæmorrhage, difficult to control, may result. Suturing such a liver adds to the infective condition, for the liver structure does not permit of drawing sutures sufficiently tight to check serious hæmorrhage from its surface; this is one of the reasons why cholecystostomy has been made in some cases. A knowledge of the size of the various ducts is quite essential; in a healthy person the lumen of the cystic duct is about one-eighth of an inch and the lumen of the common duct about one-sixth of an inch. When it is only a little enlarged and with jaundice present infection is the essential factor. A gall-bladder which has been rendered functionless by nature, disease, or operation causes dilatation above the normal of the common and hepatic ducts. A serious and not uncommon cause of jaundice is the too radical extirpation of the gall-bladder and cystic duct and section of the common duct in cases in which jaundice was not a previous symptom, and in which the hepatic duct is mistakenly ligated for the cystic; primary jaundice and later a prolonged biliary fistula result, following which intermittent closure leads to intermittent jaundice. In such cases if the condition is not recognized immediately and very early union effected by means of a Sullivan T-tube the common duct undergoes atrophy and cannot be utilized again. The effort to secure delivery of bile from direct incision of the liver or by trocar, tapping a

dilated duct, is a last resort from which relief is only temporary, and if unsuccessful life is possibly shortened by free hæmorrhage.

Jaundice in which the head of the pancreas shows marked hardness, lobulation, and increase in size, requires most careful consideration. If the gall-bladder is distended the condition is due either to pancreatitis or to a malignant change, since the pancreas, as Opie has shown, surrounds the common duct in 32 per cent of persons sufficiently to make obstruction possible by pressure Obstruction from swelling at the tip of the ampulla may cause a pancreatitis by forcing bile through the major duct of Wirsung back into the pancreas and out of the duct of Santorini. The pancreas, in its development, is evidently prepared for such emergencies since all the ducts of the organ open into the lumen of the larger ducts by passing along its wall for some distance. The closure of the ducts is caused by tension, which is nature's method of protecting all important ducts, such as the salivary and common ducts, and the ureters near their exits, as was shown by Coffey.

A careful examination of the pancreas in all cases of gall-bladder disease or surgical gastric disease indicates that the pancreas is secondarily involved by infection following gall-bladder disease more frequently than has been supposed. When secondary infection of the pancreas is a marked feature of gall-bladder disease, it may be advisable to provide drainage from the common duct, but usually the gall-bladder may be looked on as a primary focus, and should be removed. In most of the simple obstructions due to stones in the common duct, effective drainage is established after removal of the stones by means of the Robson tube passed into the opening of the common duct and up into the hepatic duct. The tube is held by a fine catgut suture as it emerges through the common duct incision. The suture serves also to close the opening about the drain. In cases of obstruction associated with distention of the gall-bladder, short-circuiting is best done by attaching the gall-bladder, after it has been emptied, to the duodenum. An opening one-half inch in diameter is made in the fundus of the gall-bladder, the peritoneum is denuded

Fig. 1. (a) Sullivan tube for common duct drain; (b) buried tube (C. H. Mayo) for uniting hepatic duct to stomach or duodenum.

for about one-quarter of an inch from the opening; it is then passed for one-quarter of an inch, through an incision at a conveniently near point, into the lumen of the duodenum. Such openings prove more permanent than the margin-to-margin union of the opening in the gall-bladder to the opening in the duodenum. In some cases with elongated cystic duct the gall-bladder is removed down to its pelvis, and this is passed through an opening in the duodenum which is then sutured around the cystic duct (Fig. 1).

Probably the most desperate and difficult cases of jaundice to deal with are those which follow extirpation of the gall-bladder and unintentional division of the common duct. The distended hepatic duct is searched for, usually among the adhesions of from two to four previous operations, or the temporary discharging fistula leading to the hepatic duct is followed. In cases in which the end of the

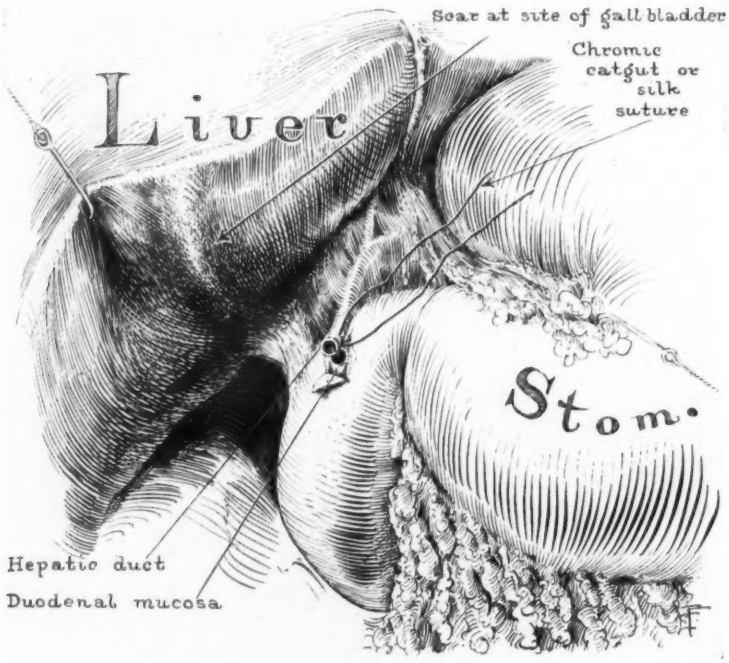

Fig. 2. Preparation for anastomosis of hepatic duct and duodenum.

hepatic duct is found opposite the duodenum or opposite the pyloric ring, the pylorus and duodenum are also mobilized and the union is made to the duodenum; this is the preferable method. Often the prepyloric region of the stomach is found adherent beside the opening of the duct. In such cases it is best to disturb the adhesions as little as possible and to anastomose the hepatic duct to the prepyloric portion of the stomach. To maintain this opening until nature contracts the tissues, developing firm union and a mucous-lined tube, it is only necessary to unite the end of the duct to the mucosa of the stomach or bowel (Fig. 2).

To facilitate this I have devised a drain which has proved most efficient and is made by cutting off the bell end of an ordinary male catheter, slipping two small rings cut from the next larger sized catheter over the smaller part of the tube, and gluing these rings with rubber cement. This little drain, varying in length from one and one half to two and one-fourth inches, is passed bell end upward into the hepatic duct, which has been loosened for a short distance. The catheter drain is sutured to the end of the hepatic duct and an opening is made into the bowel or stomach through which the lower end of the drain is passed, the lower ring catching in the wall of the bowel or stomach and the second ring just inside the end of the hepatic duct; the outer wall of the stomach or bowel is sutured around the end of the hepatic duct and protected by gastrohepatic or gastrocolic omentum adjusted around the anastomosis by sutures. The rings on the tube may hold it in place for as long as several months, or until the contraction has relaxed and the mucous membrane of the duct is united to the lumen of the bowel or stomach. In cases in which this union to the stomach is made all the bile passes into the stomach, but this is of no serious consequence and does not give any distressing symptoms (Fig. 3).

During the years 1916, 1917, and 1918, in 13

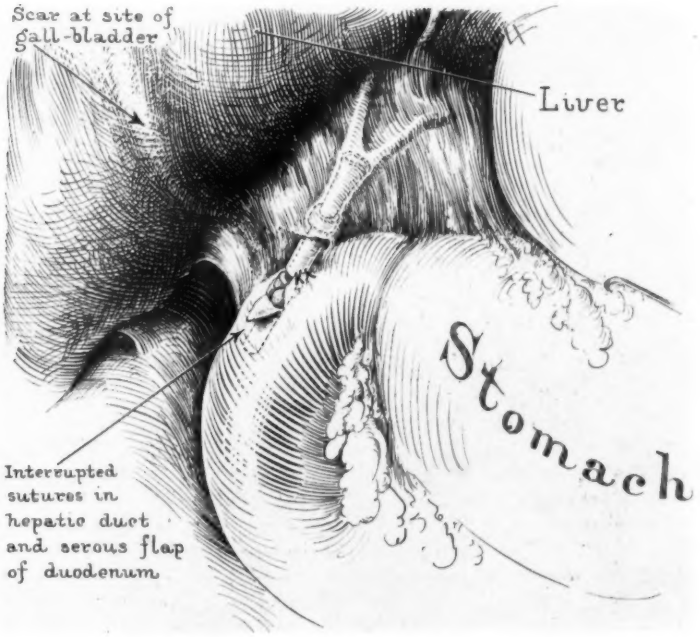

Fig. 3. Suturing partially completed; tube in place.

cases seen, it was necessary to unite the hepatic duct either to the duodenum or to the stomach; two of the patients died. Jaundice is a late symptom of gall-stone in the majority of cases, the result of neglect to recognize the condition or to advise operation in the preventive period. The mortality following cholecystectomy in the treatment of cholecystitis with or without stones is low, only 1.8 per cent in 2460 operations performed during the period of three years. There were 337 cases in which cholecystectomy and choledochotomy were both done, with a mortality of 3.2 per cent. In a group of 36 cases of very serious obstruction and malignancy, cholecystostomy and choledochotomy were done with a mortality of 16.6 per cent. Choledochotomy alone was done in a somewhat similar group of 47 cases, with a mortality of 15 per cent. If all the choledochotomies are grouped together, however, the mortality in the 420 cases is but 5.7 per cent, too high a mortality for simple cases of stone and obstruction, and too low for the late and complicated cases, including the cancers. Stones were found in the common duct in 274 of the 420 cases.

THE LATE TREATMENT OF GUNSHOT WOUNDS OF THE HEAD[1]

By H. H. KERR, M.D., C.M., F.A.C.S., Washington
Formerly Lieutenant-Colonel, M.C., U. S. A.

Of the vast amount of good that war surgery can contribute to civil surgery, there is perhaps nothing more striking than the results obtained in the treatment of head injuries complicated with paralysis. The cases with wounds of the skull involving the brain present two types of disability: one, from the skull defect, *per se*, and the one from the injury of the underlying tissue. Therefore, the treatment of these cases will be considered under two distinct heads, surgical and neurological.

Surgery can only repair the mechanical defect and its immediate results. All of the cases present to a greater or less degree the "defect syndrome." They are morose, retiring, and avoid their fellows. They suffer more or less from headache. Stooping over or turning suddenly will produce dizziness. Loud noises are extremely irritating. Exposure to the sun produces headache and prostration. Perhaps the fear of injury and knowledge of incomplete protection to their brains contribute to this characteristic train of symptoms. There is a definite disability from skull defect that is absolutely independent of any accompanying neurological lesions.

The defect syndrome can be improved or cured by the correction of the cranial defect. Various types of operations have been suggested; from the use of metal or other plates to osteoplasties of one kind or another. In the Neurosurgical Section at the Walter Reed General Hospital, we adopted the osteoperiosteal graft of Delangenière. We have modified it in two particulars. First, we prefer operation under local anæsthesia in the head-high position. This materially reduces hæmorrhage and lessens the bulge of the accompanying cerebral hernia. The patients stand the chiseling not only of the defect but in the cutting of the graft remarkably well. We have also changed the original technique in that we sew the graft to the pericranium with the bone surface inward. In this way we feel that the requirements of successful bone grafting are best obtained, i.e., a fresh autoplastic graft fixed in place with the bone of the graft in contact with living bone. The operation should be delayed for at least 3 months after healing. In cases with osteomyeletis of the skull, it is better to delay the bone graft to at least 6 months after healing of the wound.

The results have been eminently successful. No graft has failed to live and only one has not become solid within 4 months. In that case osteogenesis appears to be progressing

Fig. 1. Large cranial defect with spastic hemiplegia, repaired with osteoperiosteal graft taken from opposite side of head. Graft solid in 4 months.

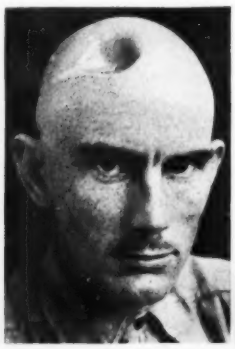

Fig. 2. Defect of frontal bone with extreme depression, repaired with osteoperiosteal graft taken from tibia.

[1] Read before the Southern Surgical Association, New Orleans, December, 1919.

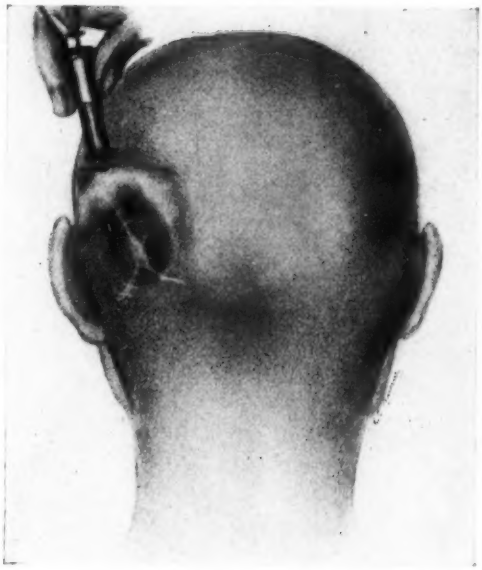

Fig. 4. Operation, first step. Subglial injection of 1 per cent novocaine.

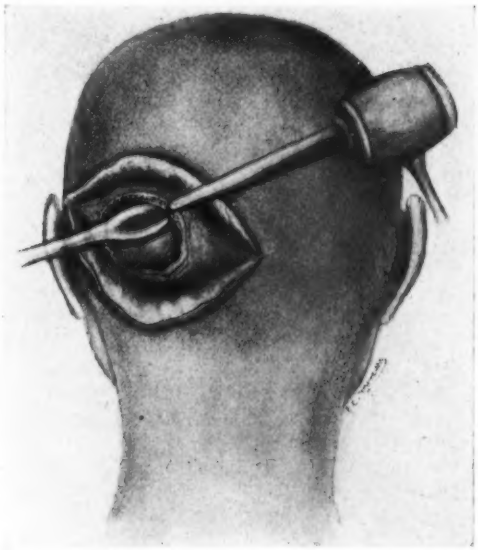

Fig. 5. Operation, second step. Exposure of bone defect and freshening edges with chisel.

from the periphery, and a successful, though depressed, correction is expected.

The effect on the patients is most encouraging. They become bright, active men, who resume their normal place among their fellow-soldiers and attack the problems of re-education with a hopeful vigor. Their dizziness is relieved. The headache disappears in the majority of cases. The graft protects them from the irritation of loud noises and the heat of the sun.

Although the question as to whether a skull defect should be repaired or not may still be debated, we feel from our personal experience that it is settled in favor of the repair.

As to the treatment of the neurological complications of gunshot wounds of the head we have followed the works of Shepherd Ivory Franz, scientific director, Government Hospital for the Insane. Dr. Franz has kindly visited our clinic and given us the benefit of his personal advice on many occasions

The first requirement in these cases is a thorough study by a competent neurologist. On the basis of his diagnosis the treatment is prescribed. In the cases of gross spastic paralysis, daily massage and splinting is instituted at first. The masseuse is instructed gradually to stretch each contracted muscle. The overstretched extensors are treated by massage and deep transverse percussion. The massage is accompanied by passive exercises with special attention to extension to overcome the continued flexion. Splints which overcorrect the contractions may be worn

Fig. 3. Frontal defect repaired with osteoperiosteal graft.

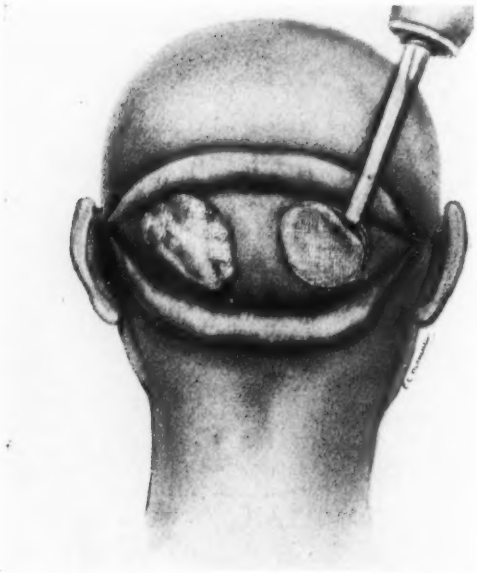

Fig. 6. Operation, third step. Linen pattern of defect cut and laid on neighboring pericranium as a guide to chiseling off osteoperiosteal graft.

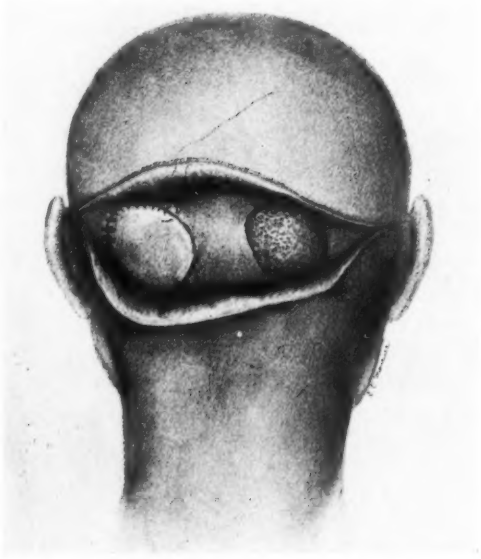

Fig. 7. Operation, fourth step. Graft being sutured over defect bone surface inward.

intermittently. The massage and passive exercises are employed to make possible the voluntary use of the extensors in simple movement. In certain cases, voluntary movement could not be obtained for some weeks, but in all cases it was eventually brought about. At a very early date the patients are gotten out of bed and urged to walk. During this early period, a right angle stop splint has to be worn on the ankles to permit locomotion. Crutches and, later, canes are necessary, but their use is soon discouraged and the patient made to walk by himself, no matter how awkwardly or slowly he does it.

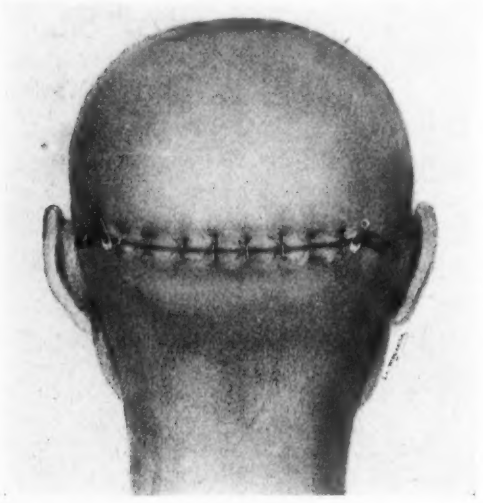

Fig. 8. Operation, fifth step. Closure of wound with 24 hour drainage.

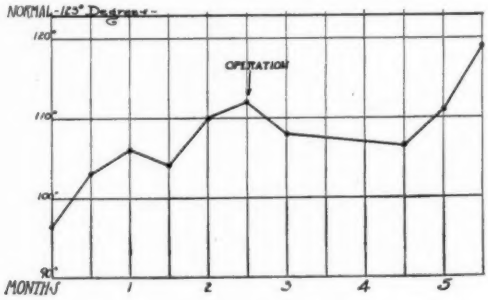

Chart 1. C. L., Gunshot wound of head. Hemiplegia. Chart shows dorsiflexion of left ankle.

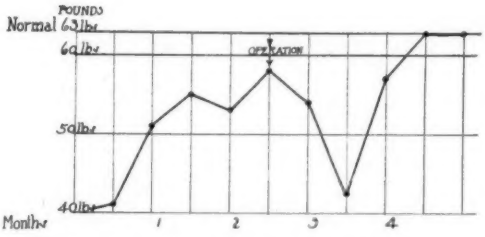

Chart 2. DeM., J. Gunshot wound of the head. Hemiplegia. Showing strength of right anterior deltoid.

Under such a régime the bed ridden paralytics were soon up and around the wards. The cases were then given re-educative exercises of a competitive nature or in game form. Each movement must be considered in the light of its three components: its extent, its force, and its time. The exercises aim to produce, first, extent of motion; later, force; and finally, rapidity. When all three have been brought to normal an accurate motion has been produced.

Stepping over a string standard, kicking a basket-ball at a target, dropping a tennis ball into a basket are types of the exercises employed.

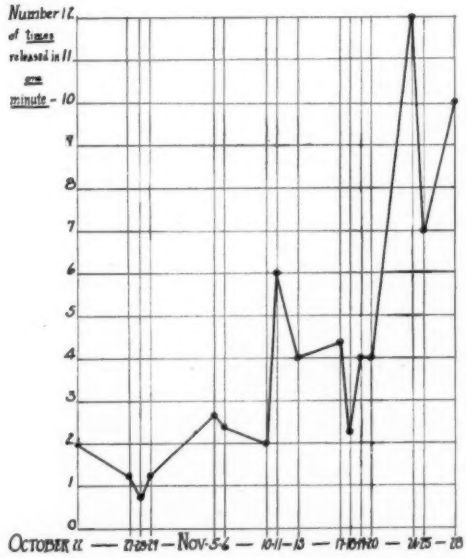

Chart 4. R., J. Gunshot wound of head. Hemiplegia. Chart shows the number of times ball was released in one minute.

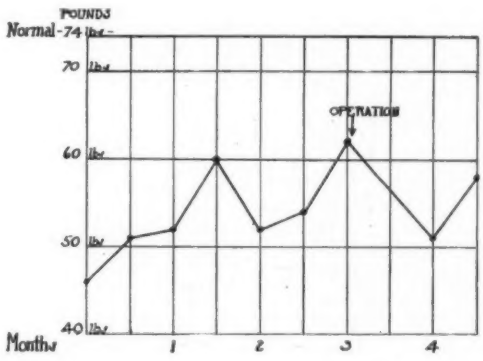

Chart 3. Same case as in Chart 1, showing flexion of right elbow.

The game idea and the sense of competition is made an integral part of the re-education. To this end scores are kept of the different exercises and games in which the patients take part. For instance, a man's ability to stretch his arm up the wall, or to release a tennis ball into a basket a certain number of times in a given time, is measured from day to day and compared to like efforts of his fellow-patients. A game of base-ball is played every day by all the patients together. It is most interesting to watch one of these games. No matter how awkward a motion may be performed under the stimulus of the game the patients somehow seem to be able to make hits and score runs, apparently forgetting their disability in the effort.

In addition to the scores of their exercises, each patient is measured as to his extent,

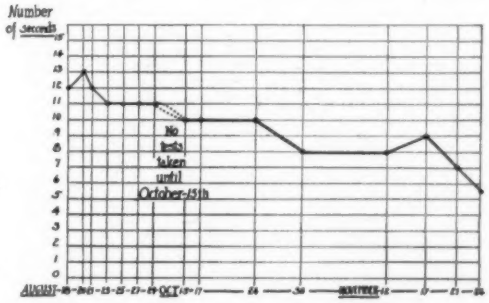

Chart 5. Same case as in Chart 4. Showing number of seconds consumed in running 20 meters.

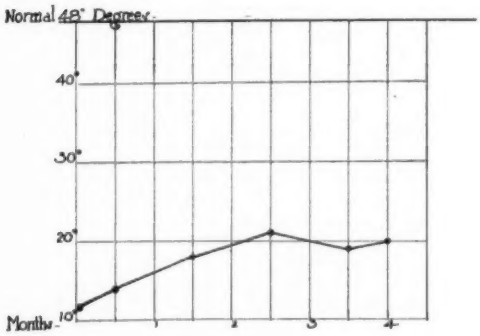

Chart 6. Same case as in Charts 4 and 5. Chart shows flexion of right knee.

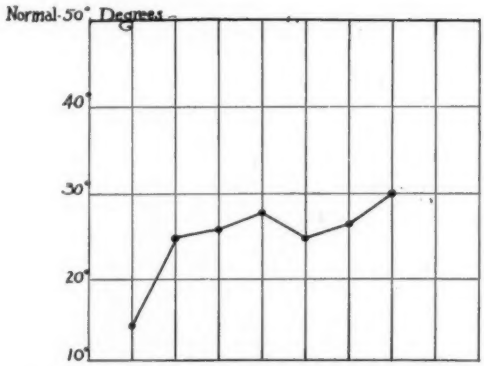

Chart 7. Same case as in Charts 4, 5 and 6, showing flexion of right elbow.

strength, and speed of movement at least once a fortnight. The results of these measurements are charted graphically and tacked to the wall where each patient may not only see his own progress, but the progress of his fellow patients. In addition to the moral stimulus that these charts give the patient himself, they are an invaluable guide to the therapy. Thus particular attention is paid to that movement which shows the least improvement. In this way, one group of muscles is brought back toward normal as soon as another, and substitution of movement does not occur. As improvement progresses exercises which educate the time and the accuracy of each movement are instituted. When the patient can grasp a pencil he is made to practice drawing a circle, then a square, and thus gradually is taught to write again.

Cases with gross defects and destruction of the motor cortex gradually acquire all the movements which they have lost. As Dr. Franz says: "We must therefore look on the different forms of cerebral paralysis as exaggerated difficulties of movement and not as inabilities to move. The facts show that the loss of certain function, because of cerebral destruction, does not indicate that the individual has not the function of capacity if suitable conditions of stimulation are provided." An experience with a large number of cases of cerebral paralysis most strikingly demonstrates that much more can be done for these cases than is commonly supposed. With proper appreciation of this fact we should be able to re-educate each case of traumatic cortical injury to a degree of practically no permanent disability.

CONGENITAL EQUINOVARUS

Report on 114 Cases[1]

By C. F. EIKENBARY, M.D., F.A.C.S., Spokane, Washington

In April, 1913, the writer gave a report in *Northwest Medicine* covering 36 cases of congenital equinovarus. Those 36 cases are included in this paper, together with 78 other cases. The number refers to the feet and not to the number of patients, since obviously each foot presents its own problem.

Twenty-two of the cases are still under treatment, the period of treatment varying from 2 to 6 months. Two of the cases operated upon within the past 6 months were of the exaggerated type, requiring a cuneiform resection. These two have been so recently operated upon that they are not included in this report.

Five of the 22 cases coming under our care during the last 6 months are being treated by the gradual process, that is, molding and plaster supports. Of these 5, 3 are entirely corrected but will have to continue with the plaster supports for at least 6 months longer. In 2 of the 5 cases, the period of treatment has not been long enough to effect a complete correction of the deformity.

Counting the 2 cured cases (Figs. 1, 2, 3, and 4) mentioned in the paragraph relative to the 22 cases still under treatment, we have a total of 94 cases on which we can make an active report.

Twelve cases were of the exaggerated type in adults or in children as old as 12, necessitating extensive cuneiform resection (Figs. 1, 3, 5, 6, 9, and 10). Two of these (Figs. 9 and 10) are still wearing casts. Figure 11 shows the condition of the feet after the removal of the first cast at the end of 4 weeks. The other 10 have been dismissed as cured. Figures 2, 4, 7, 8, and 11 show the condition of the cases after the cuneiform resection. Figure 5 shows a deformity in one little girl on whom a cuneiform resection was done. Note that in Figure 5 the view is from the back showing the feet pointing almost directly backward. Figure 7 is the same child, the picture having been taken 7 years later. Figure 8 is a brother to the girl just mentioned. His feet were of the same type as his sister's. Unfortunately the pictures taken of the brother were not good. Both of these cases were operated upon 7 years ago. The last time the writer saw the brother he was acting as a caddy on the golf course. He now writes that he has finished high school, can walk all day without tiring, and can take part in sports with other young

Fig. 1 (at left). Age 22. Severe type. Cuneiform resection.
Fig. 2. Same case after cuneiform resection.

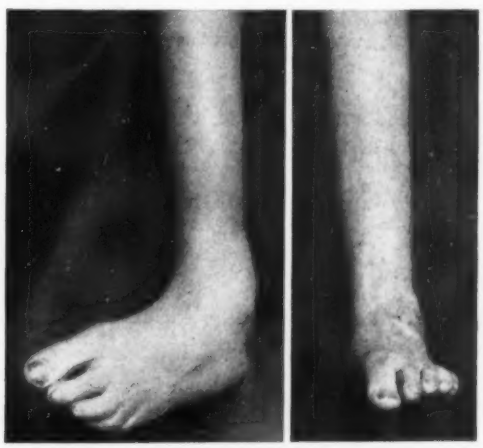

Fig. 3 (at left). Age 12. Severe type. Cuneiform resection performed.
Fig. 4. Same case after resection.

[1] Read before the North Pacific Surgical Association, December 12, 13, 1919.

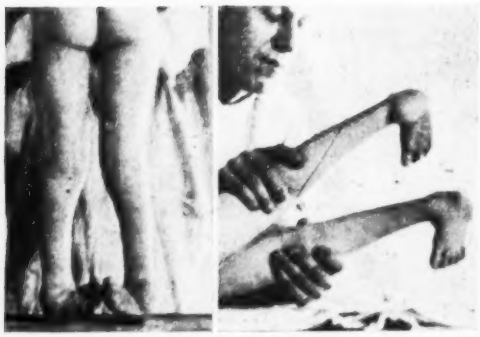

Fig. 5 (at left). Age 6. Posterior view. Note that the feet point almost directly backward. Cuneiform resection.
Fig. 6. Same as Figure 5.

Fig. 7 (at left). Same child as in Figures 5 and 6. After cuneiform resection.
Fig. 8. Brother of child shown in Figures 5 and 6. Had identical condition as sister.

men. Figure 1 is a picture of a plaster model, the patient being a girl 22 years old, with a deformity so exaggerated that all the weight was being borne on the outer side of the foot, as would be indicated by the large bursa. She was operated upon in June of this year and all supports were discarded in October. She can now wear ordinary shoes, walks with scarcely a limp, and can dance in a manner quite satisfactory to herself. Figures 3 and 4 show the foot of a boy 14 years old. In this case we see the same type of deformity with the same large bursa as shown in Figures 1, 5, 6, and 10. The foot in this case was exceedingly rigid. He was operated upon in July of this year and all supports were discarded in October. He wears an ordinary shoe and can walk with scarcely a limp. The other cases included in the group on whom a cuneiform resection was performed, are cured, the period of time varying from 4 to 8 years.

Twenty-five cases, including the 5 mentioned as still under treatment, have been treated by the gradual process of molding and plaster supports. Excluding the 5 cases still under treatment, all of these patients are cured, the length of time elapsing since the dismissal of cases varying from 2 years and 6 months to 12 years. Figure 12 shows one of these cases taken at the time of starting the treatment, the first molding having been given before the Spokane County Medical Association in the spring of 1908. Figure 13 shows the feet at the present time, approximately 12 years later, a result that is all that could be desired.

Seventy-seven cases have been treated by forcible correction, with or without tenotomy of the Achilles tendon. Fifteen of this group have been operated upon since the middle of June of this year and are, therefore, still wearing plaster casts. All of the 15 are now corrected, and we are now merely waiting for a sufficient time to elapse to effect a permanent cure. One case in this group had an attack of infantile paralysis shortly after being dismissed as cured. The muscles involved were those of the outer side of the foot, thus causing a complete relapse into the attitude of deformity. Shortly after this the writer went into the service, and the foot is still uncorrected. In one case the father became disgusted and took the case from under the writer's care, owing to the fact that he had been told that the foot should be entirely well within a year. The result in this case is unknown. One case went from under the writer's care about 6 months after the operation, and later came under the care of Harry Sherman, of San Francisco. The result in this case as shown in Figure 14 is quite perfect, and no one seeing the boy walk would suspect that the boy ever had a club-foot. One case disappeared one week after the operation and has not been seen since. One case died of scarlet fever before

Fig. 9.

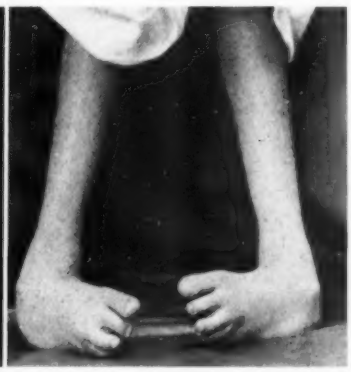

Fig. 10.

Fig. 11.

Fig. 9 (at left). Age 9. Severe type. Posterior view.
Fig. 10. Same case as Figure 9, anterior view.
Fig. 11. Same case as in Figures 9 and 10, after cuneiform resection.

the cure of the club foot could be effected. This leaves 57 cases, all of which have discarded all retentive apparatus, the period since discarding apparatus varying all the way from 31 months to 11 years. Six out of this group had very resistant feet and were never quite entirely overcorrected. Those 6 cases have only fair results. The feet can be dorsiflexed to a position at right angles to the leg, but cannot be brought above this point, a condition that is not conducive to a good foot. All of the 6 have a very slight degree of pigeon toe. However, the results in the 6 cases are such that the parents are well satisfied and prefer to leave the children as they are rather than to subject them to further operative measures. The results in the remaining 51 cases are all that could be desired. In all the cases the patients have good walking feet, all walk without limping, and none is pigeon toed. In all the cases no one would be able to tell that equinovarus formerly existed. Figure 15 shows one of these cases before the operation and Figure 16 shows the foot after operation, the second picture having been taken 4 months after the first. Note that the line of weight-bearing falls through the patella and through the crest of the tibia and the base of the second toe.

TREATMENT

There is no mystery surrounding the correction of a club-foot, nor are the surgical problems at all difficult. Some of the cases are quite resistant, some may relapse and have to be done over, some may require a cuneiform resection, but all of them may be given good walking feet. In spite of this, failures are quite common. Of the 114 cases embodied in this report, 60 had had previous operations or manipulations.

The writer considers that there are three reasons for failure:

1. The operator fails to grasp the fact that he is dealing with a triple deformity—equinus, varus, and adduction of the anterior part of the foot.
2. The deformity is not *over* corrected and frequently not even corrected.
3. The retentive apparatus is taken off too soon.

In considering treatment, it might be well to divide the cases into three headings: namely, mild or moderately severe cases in young babies; mild or moderately severe cases past 6 months of age; severe cases past the sixth year of life. Naturally the periods of time mentioned are merely suggestive. The extent of the deformity and the development of the individual should be the deciding factors.

MILD OR MODERATELY SEVERE CASES IN YOUNG BABIES—FIGURE 12

In this type the correction can easily be brought about by the gradual method. The foot is manipulated at intervals of from

Fig. 12 (at left). Ordinary type seen in infants.
Fig. 13. Same case as in Figure 12. After 11 years. Gradual correction by molding and plaster casts. No anæsthetic given at any time.

a week to 10 days, a plaster cast always being applied in the position of the *greatest correction*. The cast should extend above the flexed knee in order to prevent rotation, to relax the gastrocnemius, and also to prevent the child from kicking off the casts. Full correction may be brought about by this method in a month, it may take several months, and it may fail entirely, depending upon the resistance of the tissues and the skill of the operator. When full correction is obtained, the foot should be retained in a plaster support, usually for a year. Toward the latter months of treatment, it is the writer's custom to carry the cast merely to the calf line. In none of these procedures is an anæsthetic necessary.

MILD OR MODERATELY SEVERE CASES AFTER THE SIXTH MONTH

Here an anæsthetic is necessary. The procedure is the same as that described above except that the correction is made at one sitting.

The foot is manipulated until it is flabby, and the varus and the adduction of the anterior part of the foot can be readily overcorrected. The Achilles tendon is then divided subcutaneously and the equinus corrected. The writer has never found it necessary to divide any of the structure along the inner side of the foot. Here again the cast is carried above the flexed knee, and for the same reasons as given above. A year or more is usually required to remove all tendency to revert to the original deformity.

SEVERE CASES AFTER SIX YEARS OF AGE

By severe cases, the writer refers to the type as shown in Figures 1, 3, 5, 6, 9, and 10. Here a cuneiform resection gives perfectly satisfactory results and does so quickly. A wedge of bone, varying from a half inch to an inch and a half or wider is taken from the mid-tarsal region, the base of the wedge being along the outer border, the thickness of the wedge depending entirely upon the amount of deformity, enough bone being taken out easily to admit of complete correction. The wedge extends through the entire width of the bony structure of the foot. Two or three kangaroo stitches are passed through the two bony sides and the raw areas of bone securely sutured. The Achilles tendon is usually divided, although not always. Owing to the extensive work done, the length of time required to effect a cure is much shorter than with the more conservative method. Six months is usually sufficient time to bring about a complete cure, and in many instances the cure may be brought about in 3 or 4 months, as was the case in Figures 1 and 3. The operation is only suitable in the severe cases as in Figures 1, 3, 5, 6, 9, and 10.

As a final point in the cure of congenital equinovarus, the writer would like to empha-

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 14. End-result of case that passed from the writer's care. Case finished by Harry Sherman, of San Francisco.
Fig. 15. Usual type. Treated by stretching and tenotomy of Achilles.
Fig. 16. Same case as in Figure 15. Case still wearing cast.

size the necessity of walking, that is, weight bearing in the correct position, as a part of the cure. For this reason in the case of young babies, where the correction may have been made within a few months time, the writer deems it necessary to keep these cases under his observation until they are walking. In cases where stretching and tenotomy are done, as well as in the cases where cuneiform resection is done, the writer insists upon walking in the casts at the earliest possible moment, thus materially helping in the adjustment of the structures of the foot to their new relations.

RESECTION OF DOUBLE KIDNEY

By FREDERICK C. HERRICK, M.D., F.A.C.S., Cleveland, Ohio

THE surgery of the congenitally deformed kidney forms a line of progress made possible by modern methods of urological diagnosis and the advance in surgical technique. This progress is evidenced by the tendency toward conservatism, which aims at removing the pathological condition only and leaving the normal tissue capable of functioning. This has necessarily been the practice in single organs of the body, but in paired organs such as the kidneys, the practice has too often been to sacrifice a diseased kidney when possibly repair or resection would have equally relieved the abnormal condition and have saved to the individual part of his margin of safety.

In kidneys with double pelves, one containing a calculus or being the seat of a hydronephrosis, this principle readily applies. Young and Davis (1) report calculus destruction of the upper pole of such a kidney with resection and saving of the lower pelvis and kidney tissue. This they report as the only fully reported case of resection of the diseased portion of a double kidney to be found in the literature. They give an excellent embryological survey of the subject.

Fig. 1. Roentgenogram showing double renal pelvis.

The following case of violent renal colic, hydronephrosis in the lower pelvis of a double kidney with successful resection is here reported.

The patient was a woman 18 years of age, referred because of attacks of violent pain extending from the right kidney region into the right fossa and down the right thigh anteriorly. The first attack occurred one year previous to consultation, when the patient vomited and was in bed for a week; there was no hæmaturia, no passage of calculi; her urinary frequency increased to two to three times a night. Since then she has been constantly aware of soreness in the right flank.

During the past 2 days these attacks have recurred. There have been no chills nor fever, no hæmaturia, no pyuria. There has been increased urinary frequency.

Physical examination showed a well developed, well nourished woman, free from other signs of disease or deformity. Respiration was costo-abdominal. There was no flank fullness nor tumor to be felt. The right kidney was palpable, descended to the second degree, was tender, and gross percussion over it in the flank posteriorly gave marked pain.

Cystoscopy at this time under difficult circumstances showed marked congestion, and bullous œdema around a right ureteral opening. The left opening was normal but small. Wax tipped catheters were passed up both ureters but showed no scratches.

The patient came to Cleveland and entered the hospital. An X-ray for stone was negative.

A second cystoscopic examination was made. The left ureteral opening was normal in appearance, contracted normally, and clear urine was coming from it. The right opening was in its normal posi-

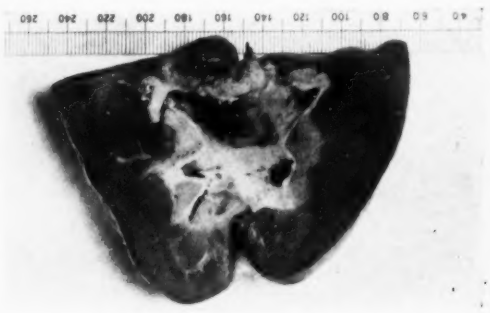

Fig. 2. Resected portion of kidney.

tion, slightly congested, with bullous œdema about it. About 3 millimeters above it was another opening, very small, tunnel-shaped, pale-colored, contractile. A functional test with a plugging catheter on the left side showed the left kidney secreting 25 per cent phthalein. The right side (from both ureters obtained by bladder catheterization) secreted 35.5 per cent. At another time with two catheters in the two right ureters the upper half (the lower ureteral orifice) secreted 12.5 per cent, the lower half (the upper ureteral orifice) 20.5 per cent, the left kidney 25 per cent. The urine from the lower pelvis contained a positive amount of albumin; that from the upper only a faint trace; neither contained pus nor casts. Pyelography showed a double pelvis on the right side. not connecting with each other, and two ureters passing separately, crossing, as usual, above the bladder (Fig. 1). In the X-ray it appears as though the lower ureter had a sharp kink just after leaving the pelvis. The lower pelvis showed its major and minor calyces dilated. The right double kidney therefore was doing more work than the left and the 25 per cent excretion of phthalein on the left is a fairly low amount upon which to rely after a nephrectomy of the opposite side. Add to this the fact that with a double kidney on one side the other side is likely to be a small kidney and working to its maximum. The urea nitrogen excretion from the two sides was as follows: the upper pelvis on the right excreted .053 grams of urea nitrogen per 100 cubic centimeters; the lower .065 grams; the left kidney secreting .142 grams of urea nitrogen per 100 cubic centimeters. Examination of the blood showed no retention of non-protein nitrogen containing 9 milligrams per 100 cubic centimeters.

Right-Upper 12.5 per cent phthalein .053 grams urea nitrogen.
Lower 20.5 per cent phthalein .065 grams urea nitrogen.
Left-Upper 33 per cent phthalein .118 grams urea nitrogen.
Lower 25 per cent phthalein .152 grams urea nitrogen.

A diagnosis was, therefore, made of a double kidney on the right side, the lower pelvis of which was hydronephrotic, and was causing attacks of pain. It was further evident that it would be best to save the upper half of the right kidney if possible. After removal of the lower half of the right kidney, represented by its 20.5 per cent phthalein excretion the total phthalein output after operation would be 37.5 per cent.

Operation, November 11, 1916. The right renal incision from the tip of the twelfth rib obliquely, intermuscular. The kidney was delivered and found large with a very slight sulcus corresponding to the apparent separation of the two pelves. The lower pelvis was well dilated. The vessels to the lower half of the kidney passed dorsally to the ureter and could not have obstructed it. A resection of the kidney was performed by a circular incision extending obliquely upward, removing the lower half together with its hydronephrotic sac. The incision was made oblique with the intention of more easily closing the cut surface. The intracapsular tension, however, was sufficient to cause the renal parenchyma of the upper half to bulge down entirely obliterating this wedge-shaped depression. Four mattress sutures were placed entirely controlling the hæmorrhage. The lower ureter was then divided between clamps, cauterized, and ligated.

The uncovered parenchymatous surface was now carefully covered with Gerota's fatty capsule stitched to it with No. 1 gut. The kidney was allowed to drop back into its fossa. A tell-tale drain of gauze was placed for 48 hours.

Recovery was uneventful. On the fourth day a slight discharge of urine occurred from the lower angle of the wound, where the gauze had been, but this stopped permanently after 2 days.

October 20, 1919, three years after operation, the patient has had no further symptoms, has borne a child normally, and is in perfect health.

Chronological review of cases of resection of double kidney found reported.

CASE 1. Reported by Rumpel (2), in 1914. Male, age 36. Nephrolithiasis and partial hydronephrosis, with double formation of the renal pelvis. Resection of the hydronephrotic half.

Ten years before consultation the patient had bladder trouble. Two weeks before consultation he had recurrent attack with colic-like pains in the left flank associated with bloody urine. Following this the patient had day chills and a rise in temperature to 39°.

Cystoscopy showed four ureteral openings, symmetrically arranged. All openings were slit-like and small, and there was no evidence of inflammatory reaction except in the left upper one, which was surrounded by a reddish area, with œdema. Indigocarmine appeared strongly through all openings except the upper left. X-ray showed a large kidney, with three stones in the lower part. Collargol injection showed a marked dilatation of the lower pelvis.

Operation. A large, fœtally lobulated kidney was freed from its fatty capsule, with difficulty. A number of large cysts was present on the convex surface. The lower pelvis and ureter were markedly dilated. Division of the lower hydronephrotic part of the kidney was accomplished after digital compression of the vessels and simple resection. The kidney stump was sutured. Drainage was used.

The specimen showed largely dilated calyces, three small calculi, and a very narrow edge of renal parenchyma. A urinary fistula resulted and was present to a slight degree at the time of report.

CASE 2. Reported by Rumpel in 1914. Male, age 35. Partial hydronephrosis with double formation of the pelvis. The patient has had increased frequency of urination for the 5 years previous to consultation. He was treated for stricture of the urethra by the passage of sounds 2 months previously.

Cystoscopy. Because of intense cystitis and the large amount of pus present, the ureteral openings could not be recognized. A perinephritic abscess developed, which was drained and healed.

A second cystoscopy was done 6 weeks later. Four ureteral openings were recognized: on the right side, two close together; on the left side two about 2 centimeters apart. The left upper opening was dilated and gaping. All four openings discharged urine independently of each other. Indigocarmine appeared from all openings except the upper left. Pyelography showed a largely dilated lower left pelvis presumably of the mechanical type.

Operation showed a very large kidney, the upper half apparently normal, the lower half resembling a round tumor the size of a small fist, clearly cystic in type, and a bluish gray in color. The kidney was delivered with difficulty. A strong catgut thread, by means of a Ferguson needle, was placed around the entire circumference at the point of apparent division between the normal and hydronephrotic renal pelves. A clamp was placed on the lower half, the tissues were divided between the two, as also the ureter between clamp and ligature. Hæmorrhage was controlled by two deep sutures through the parenchyma of the sound tissue. In dividing the ureter, the normal ureter of the upper pelvis was accidentally cut. Because of its thinness and the difficulties attendant thereon, it was not implanted in its pelvis and was ligated. The ureter belonging to the lower pelvis, which was removed, was implanted in the upper pelvis, as it was thicker. The kidney was replaced. The wound was closed with rubber drainage.

The specimen showed a greatly dilated pelvis with scarcely any renal tissue visible. A urinary fistula was present at the time of writing.

CASE 3. Reported by Young and Davis (1). Male, age 57 years, operated upon April 14, 1916. The patient had complained of pain in the left flank, of a dull, aching character, of 10 years' duration, with acute exacerbations. No renal colic. Urinary frequency moderately increased. An X-ray showed a large branched calculus in the upper pelvis and pyelography showed two pelves, the lower slightly smaller and its calyces normal. The upper showed its calyces markedly dilated. The ureters from the two pelves united 9 centimeters below the lower pelvis, on level with third lumbar vertebra.

Operation, April 14, 1916. showed the upper pole markedly adherent and calculi were felt. There was a distinct furrow between the two parts of the kidney. The pedicle to the upper pelvis was ligated and divided, and a transverse incision was made between the two segments just above the line of demarkation. Four mattress sutures controlled the bleeding from cut surface of lower half. The edges were approximated by pressure. Closure with drainage.

The specimen showed a mere thin-walled sac of fibrous tissue with entire absence of kidney tubules. A large branched calculus almost entirely filled the sac.

A urinary fistula developed on the thirty-fourth day but persisted for only 2 weeks.

Thorium pyelography before discharge showed a small left pelvis. Phthalein appeared, from the left side 3 per cent and from the right side 15 per cent.

Four months after operation the urine from both sides was normal and the phthalein output was 20 per cent from the right side and 5 per cent from the left side.

CASE 4. Reported by Herrick. Operated upon November 11, 1916.

CASE 5. Reported by Mayo (3). He says "renal stones were found in two patients with duplication of the renal pelves. In both, the caudal pelvis was involved; in one, a pelviolithotomy sufficed, but in the other a resection of the upper half of the kidney was necessary."

REMARKS ON DIAGNOSIS

In the diagnosis of surgical disease of the kidney, the frequency of congenital deformity must always be kept in mind, as well as the difficulty of finding supernumerary ureteral openings. These may vary in size, being larger than the normal, or smaller, to complete atresia; may have a normal shape and sphincteric action, or follow the several variations of the usual diseased ureteral orifices. They may be placed in the bladder, vagina, rectum, or perineum.

I recently removed a hydronephrosis in which the atretic ureter was attached to the rectum, was tremendously dilated and tense, and formed a teat-like process an inch and a half long, projecting into the rectum. This teat-like projection was felt *per rectum* during the general physical examination. There was no impulse in it on coughing, although it was quite tense, which ruled out hernia. It could be invaginated like the finger of a glove. It was not inflammatory, nor the result of trauma. It was, therefore, considered as a congenital deformity, though the exact nature of it was not surmised until at operation.

At operation an immensely distended left ureter and renal pelvis were found, and the ureter was 2 inches in diameter. The renal pelvis and ureter held 500 cubic centimeters of watery, slightly cloudy-looking fluid.

In the perineum ureteral openings are suspected when the patient is unable to keep him or herself dry, and there is no history of vaginal trauma, although there may be perfect control of bladder urine. In such cases

the folds of the urethral sphincter or the vaginal labia are especially difficult in which to locate an opening. The injection of a dye substance may be of assistance. Within the bladder they are located upon or in the close neighborhood of the trigonal borders. A close grouping of blood vessels may attract attention and surround the orifice. The bladder sphincter has been noted as a possible location. Weigert's rule, although exceptions to it are recorded by Braasch (4), must be remembered, i.e., that the distal opening drains the proximal kidney pelvis.

FREQUENCY OF RENAL ANOMALIES AND THEIR TENDENCY TO DISEASE

Glénard (5), in 1905, collected 527 cases in the literature. Dorland (6), in 1910, collected 121 in the following groups:

	Percentage
Horseshoe kidney	29.2
Absence of one kidney	19.5
Rudimentary kidney on one side	9.6
Displaced kidneys, one or both pelvic and one normal	16.9
Supernumerary kidneys	4.0
One-sided double kidney not fused	3.2

Malformation predisposes to disease. Young and Davis (1) quote (51,504) a large series of autopsies with one horseshoe kidney in 715 subjects, while in 1,000 kidney operations they found the same condition in the proportion of 1 to 143 subjects. Again, Robinson reports 50 cases of double ureter showing hydro-ureter in 24 per cent. In double kidney the pathological process occurs in the upper part in 79 per cent (19 of 24 cases). In the above case, as is more likely in hydronephrosis, the disease was in the lower pelvis. Rumpel's second case was of this kind.

RÉSUMÉ

1. Resection of a diseased double kidney or the diseased portion of a single kidney may be advisable in order to save a necessary amount of kidney substance for the individual.

2. The resected end surface should be covered with fatty capsule.

3. I am able to find in the literature four other reported cases of resection of double kidneys.

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BLOOD-VESSEL SURGERY IN THE WAR[1]

By BERTRAM M. BERNHEIM, M.D., Baltimore

OPPORTUNITIES for carrying out the more modern procedures for the repair or reconstruction of damaged blood-vessels were conspicuous by their absence during the recent military activities in France. Not that blood-vessels were immune from injury; not that gaping arteries and veins and vicariously united vessels did not cry out for relief by fine suture or anastomosis. They did, most eloquently, and in great numbers, but he would have been a foolhardy man who would have essayed sutures of arterial or venous trunks in the presence of such infections as were the rule in practically all the battle-wounded.

Pressure of work, of course, had a deterring effect on fine work of any and all character—especially during the great battles where all refinements were cast to the winds in the general effort to save life. But quite aside from this, the blood-vessel suture had no place in the work of salvation. There were times and there were places where the stress was not so burdensome. And the equipment as regards fine suture material and delicate instruments was in hand, to say nothing of certain surgeons whose pre-war experience might well have permitted them to negotiate the work successfully—other things being equal. But, even in the casualty clearing stations and the small advance hospitals for seriously wounded, conditions were unpropitious. The risk was too great—the risk of secondary hæmorrhage following the breaking down of the suture by infection; for, whereas it was possible in a great proportion of the cases to do successful primary closure after careful *débridement* of wounds only 4 to 12 hours old, repair of damaged arterial and venous trunks could not be included in the list of cases amenable to such treatment. And this was true for the very good reason that, while certain low-grade infections were overcome in properly excised wounds and the more virulent infections resulted merely in complete opening up and drainage of such wounds, neither the one nor the other could have been tolerated in the presence of a blood-vessel suture. Disaster would have come about in either event.

There were exceptions, to be sure. Certain isolated successes will be reported without a doubt. But the teachings of Carrel together with the laboratory experiences of his followers had so effectually demonstrated the futility of attempting blood-vessel suture in any but a non-infected field that it needed but a glance at the type of wounds to be dealt with to realize from the outset the hopelessness of the finer blood-vessel surgery.

Excision and ligation were the rule. This was rather distressing, too, in many instances, particularly when only the side of a vessel had been injured or when the continuity could have been re-established by a simple end-to-end suture with or without a venous transplant. It required a high order of self-restraint to forego some of these cases—for there were many.

But after all, our knowledge of the incidence of gangrene subsequent to ligation of arterial or venous trunks of the extremities is unfortunately not profound. And it was this fact as much as anything else that influenced one toward the conservative and at least life-saving ligation. For even if gangrene did supervene, amputation was in most instances about the worst thing to be feared—an eventuality by no means as fraught with danger to life as a furious secondary hæmorrhage following an unsuccessful attempt at suture. For most of the men with injured great blood-vessels had already bled considerably and further loss of blood that was preventible was not to be considered.

So with simple ligation the rule in practically every instance of blood-vessel injury, small or large, the comparatively small number of cases of gangrene that resulted from this practice was to me little short of a revelation, that is, as concerns ligation of the femoral and axillary vessels. It may be

[1]The observations upon which this paper is based were made at advance hospitals for the seriously wounded, at evacuation hospitals, and at base hospitals, the period of observation being nearly two years.

that the youth and wonderful physical condition of the patients had something to do with the matter, although it has been commonly supposed that an adequate collateral circulation takes considerable time for its development in most instances. Hence it is usually seen in its highest development in those slow-going circulatory disturbances of the extremities so commonly seen in the aged, or near-aged. Possibly a more rational explanation is that as the vein is usually injured simultaneously with the artery, ligation of both artery and vein occurs at the same time. Thus though the inflow of blood is decidedly deranged, its outflow is definitely impeded. In other words, the most possible is made out of what little blood that does get to the affected part because it is held there longer than usual; for I think it is now rather generally agreed that if an arterial trunk is torn or injured, it is wise to impede the outflow of blood by ligating its accompanying vein even though uninjured.

There was a definitely higher percentage of gangrene following injury and ligation of the popliteal and brachial vessels, but that was to be expected, since the closer one approaches the terminal vessels the more gangrene does one encounter. Even so, in most cases there were complicating factors such as gas bacillus infection that obscured matters, but whether this was *post hoc* or *propter hoc* can not be said with certainty. Greater or lesser degrees of ischæmia, however, were not uncommon among the cases that escaped actual gangrene, resulting in severe atrophies and contractures of a more or less crippling nature. Even so an arm or leg of such type, unless too badly damaged, is better than none. I call to mind that case done in Base Hospital No. 18 by Dr. George Heuer—an aneurism of the axillary artery, the tissues all about being pus-infiltrated. Excision and ligation was followed by a marked atrophy and sensory disturbances of the whole arm, but enough function remained to warrant retention of the member. An arteriovenous aneurism of the popliteal vessels in which I practiced a similar operative procedure gave rise to a somewhat shrivelled leg, but the patient was able to walk and that was most satisfactory under the circumstances. That was an interesting case, too. A pistol bullet had passed through the knee-joint doing little damage to the bones. No operation was done and, as in many cases of this nature, the joint remained uninfected. But ten days after the injury the aneurism suddenly became apparent and at operation it was found that the bullet had just nipped both popliteal vessels. Even so, the vessels might have done no more than leak into each other had their immediate area not become infected. This was an instance then of a major joint being able to withstand an infection while the tissues surrounding blood-vessels succumbed to infection. It further illustrates quite well the point I have been making that vascular anastomoses whether made by suture or by a missile will hold only if there is no infection. In the case just cited, had the field remained sterile a typical arteriovenous aneurism would have remained and gradually developed. Some months or some years later, whenever it gave trouble, a reconstructive operation might have been successfully accomplished.

We had two other cases of this type—arteriovenous aneurism of the popliteal vessels—in the hospital at the same time as the one just mentioned. And in these, too, ligation of both artery and vein was practiced. One of them developed a gas bacillus infection which spread so rapidly that a mid-thigh amputation had to be done in order to save the man's life, while the other one came through with a fairly useful leg. This was an extremely interesting case. The patient, having had his primary operation elsewhere, came in with what looked to be an ordinary dirty wound of the popliteal space. After the most painstaking work, Dr. George Dunn, who had the case in charge, finally got the wound in shape for a secondary suture and was actually engaged in carrying this out when there was a sudden, furious gush of blood that was only controlled by tampon and later by a tourniquet. Investigation revealed the damaged vessels. It might be felt by some that in a case like this where bacterial counts had been made and the situation so controlled as to

permit of the wound's suture, conservative measures with regard to the blood-vessels should have been instituted. I can only say that secondary sutures are by no means certain even where conditions have been most accurately gauged, and I rather felt that the chances were against a successful suture. That my surmise was correct was evidenced by the fact that the wound under consideration broke down. It is conceivable, though, that with the circulation re-established and the surrounding tissues better nourished, primary healing might have ensued.

I have stated that blood-vessel injuries were quite common. That they were not of far more frequent occurrence was always a source of amazement to me. I have seen arms and legs, the bones of which were frightfully shattered by bullets or high explosive fragments, some penetrating, others through-and-through, leaving huge gaping wounds. Yet the blood-vessels were untouched. This remarkable phenomenon is surely referable to the inherent elasticity of the vessels by means of which they were enabled to avoid injury. The explosive force of the impact must just have forced them out of the missile path. Sometimes, though, where they were caught, crushed, and torn with the bone fragments, the wound of entrance was small and where there was no wound of egress, or a very small one, there ensued a muscle infiltrating hæmorrhage of such extent that frequently a whole thigh became one huge, tense, blue-black hæmatoma — all most conducive to gas bacillus infection. Such cases were best handled by immediate amputation at or above the seat of injury, since the ischæmia consequent upon ligation, the radical *débridement* that perforce had to be done, together with the severe bone injury could have but one result—a fulminating gas bacillus infection and gangrene.

I personally saw no injury to the carotid arteries—probably for the reason that practically all of them were immediately fatal. I did see a machine gun bullet lodged flush up against the jugular vein, but its removal was attended with no difficulty or after-effects, the vessel being intact! Injury to the vessels at the elbow were occasionally seen, but curiously enough they were rarely just at the bifurcation of the brachial artery and so, unless the bony condition necessitated amputation, *débridement* of the wound with ligation of the affected vessel sufficed. But there was one vessel whose injury always gave trouble—the peroneal artery. And it was remarkable how frequently we came across it. Three in one afternoon do I recall and in all three the ends were extremely difficult to catch and tie, due of course to the position of the vessel and its pronounced ability to retract when severed. I have heard it stated that injury to this vessel with the great amount of trauma incident to its capture almost always eventuated in gas bacillus infection with amputation later on. This is certainly a most pessimistic exaggeration. Careful *débridement*, ligation, and leaving the wound wide open gave good results in all our cases.

Of course, thrombus formation in the injured vessels was the great life-saver, but this very feature made it most imperative to search carefully the condition of the vessels exposed in wounds of great extent, especially where the vessel continuity had not been interrupted. I shall never forget that case where an assistant called my attention to a slight lateral bulge of a throbbing femoral artery, his impression being that the vessel wall had been crushed a bit and that an aneurism was in process of development. My suggestion that he hold the vessel between his fingers and then gently stroke the site of the bulge with dry gauze revealed a tear with an occluding thrombus. Ligation above and below was done with no ill effects. We saw a number of cases of this nature.

The foregoing statements will probably seem rather strange to those who were not fortunate enough to go abroad. Not having had any previous war experience, I was surprised myself. I will even confess to having taken over with me blood-vessel silk, needles, liquid vaseline, in fact all the delicate armamentarium that went with my work at home. But it was no use. There was no place for surgery of this type. During battles the efforts of all surgeons must be concentrated along the lines of saving life, with the point

always in view of the greatest good to the greatest number. After battles, efforts must be concentrated on cleaning up infections and doing reconstructive work. Blood-vessel surgery may have its place in the reconstructive work, perhaps, but I am rather of the impression that most of it will be done in the years to come when aneurisms of various sorts will begin to crop up, the aftermath of vessels wounded in France in youth but able to hold their own and carry on until age and perhaps hard work cause trouble in the weak spot.

TUBERCULOSIS OF THE BREAST

By EUGENE P. HAMILTON, M.D., Kansas City, Missouri

MRS. S. B., age 44; weight 125 pounds; height 5 feet, 8 inches; widow. The family history was negative except that her husband died of tuberculous laryngitis 8 years ago. As a child the patient was never robust. She had had scarlet fever, whooping cough, and diphtheria; also had a pulmonary tuberculosis 5 years ago, the sputum being reported positive for tubercle bacilli by the state bacteriologist. The patient says that her principal complaint at this time was nausea and extreme weakness. During this illness she was under the care of W. J. Marsh, of Tipton, Missouri, who gave her Koch's old tuberculin and had her live out of doors for about 6 months. Her condition rapidly improved and she has had no symptoms since that time. The patient entered St. Joseph Hospital, March 20, 1918, complaining of a slight soreness in her right breast and gave this history as its origin. Three weeks ago, while turning in bed one night, she bruised her breast on the mattress. It became tender and the patient noticed for the first time a hard lump. She consulted Dr. Marsh who found that the patient had a small tumor of the breast, but it was not tender nor was there any redness of the skin. On account of the patient's insisting that her trouble dated back to the supposed injury, she was advised to use hot alcohol packs to clear up the question of a traumatic mastitis. Marked redness of the skin soon developed, and it was the opinion of the attending physician that it was possibly due to the carbolic acid that was used in the alcohol.

Upon entering St. Joseph Hospital the patient was put to bed and was under observation for 10 days. During this time there was no temperature, and the blood and urine examinations were normal. The redness in the skin rapidly disappeared, but the tumor remained the same. One small gland was palpable in the axilla. The patient was operated upon on March 30, 1918. A radical breast operation was done for fear that we might be dealing with a scirrhous cancer and not a tubercular breast. One enlarged gland was found in the axillary space but none in Mohrenheim's fossa. The patient was returned to her room in good condition. Examination of the excised breast revealed a caseous area in its center. The gland presented a similar picture. The pathological report of L. A. Lynch was tuberculosis of the mammary gland. Unfortunately the tubercle bacilli were not found in the tissue, yet a section shows typical tubercles with giant cells. The other means of positive diagnosis, viz., cultural demonstration of tubercle bacilli and animal inoculation were not possible in this case, since the technician unfortunately placed the specimen immediately into formalin solution.

In reviewing the literature upon tuberculosis of the mammary gland, we find that the condition is not new but comparatively rare. Sir Astley Cooper, in 1829, reported macroscopical features of "Scrofulous Swelling of the Bosom," while Dubar, in 1881, proved, by microscopic examination, that the breast may be the subject of tubercular infection. From 1904 to 1915 100 cases were reported and as near as I can ascertain only 180 cases have been reported to date. One can only appreciate how rarely the breast is affected by comparing this case with the millions in whom foci of tuberculous infections are found elsewhere in the body.

Deaver and McFarland classify these breasts into: (a) primary and (b) secondary.

As the names indicate, the primary breasts are those in which the primary focus is in the breast. According to Demme, Pluyette, Orthmann, and Kramer (cited by Deaver and McFarland), the avenue of entrance of the tubercle bacilli may be through abrasions of skin of the nipple. Yet Babes has shown that tubercle bacilli may gain entrance through intact skin, and Ravenel has shown that the bacilli may gain entrance through intact

mucous membrane. In secondary infections of the breast, the primary foci most often are found in (1) the lungs or pleura; (2) the lymph nodes of the neck or axilla; (3) the bones, especially the ribs and sternum.

As to the exciting cause of these infections, slight trauma of the breast has been noted in a large percentage of the reported cases. This certainly was true in our case. When we take up for consideration the differential diagnosis, we should consider (1) simple pyogenic infection; (2) carcinoma or sarcoma; (3) broken-down gummata; (4) actinomycosis.

Briefly the characteristic symptoms are: (1) the rapidity of the disease process (Deaver and Geissler each report a case operated on within one month of initial symptoms); (2) early fistula formation; (3) involvement of lymph nodes; (4) pain when inflammation exists; (5) general condition of patient.

The treatment is simple breast amputation with excision of affected glands. The prognosis in these cases of primary tuberculosis of the breast is good, probably 100 per cent.

Prognosis in secondary tuberculosis will depend, of course, upon the primary focus. Braendle reports cases alive 13, 11, 9, and 8 years after operation but Strombery and Robinson (cited by Deaver and McFarland) report recurrences. Our case after 18 months has shown no symptoms of recurrence and is apparently well.

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SPERMATOCELES AND HYDROCELES CONTAINING SPERMATOZOA[1]

BY RANDOLPH WINSLOW, M.D., F.A.C.S., BALTIMORE

AMONG the not very frequent pathological conditions of the testicle is spermatocele. A spermatocele is a cystic tumor containing spermatozoa, which usually arises from about the junction of the testicle and the epididymis and is situated behind the tunica vaginalis. A spermatocele is generally a rather small, inverted pear-shaped, cystic mass, extending upward along the spermatic cord. It is not painful and, as a rule, does not cause any discomfort or annoyance, except by its presence. Sometimes the cystic mass protrudes into the tunica vaginalis when it takes on the characteristics of a hydrocele. Spermatocele occurs usually in men between 20 and 40 years of age, but is sometimes found in old men; it is found more frequently on the right than on the left side but it may be bilateral. It has been supposed that the condition was due to degenerative changes in fœtal remains about the testicle and epididymis, such as the organ of Giraldé; the hydatid of Morgagni, the vas aberrans, and the vas du rete; but according to A. C. Cabot this is an error, for a spermatocele is a true retention cyst due to any process which blocks the outlet of the seminiferous tubules. The larger cysts in the young are due to obstruction of the vasa efferentia, while the small cysts of later life are due to senile cystic enlargements of the tubules. The cyst may be extravaginal or intravaginal. It is said to be extravaginal when the cyst develops in a direction in which there is no covering of tunica vaginalis, and this is the most common variety; and intravaginal when it arises from some portion of the testicle or epididymis which is covered by tunica vaginalis. The diagnosis is made by aspiration or incision, but the nature of the cyst may be suspected from its location between the testicle and the epididymis. When the tumor has projected into the tunica vaginalis, or is complicated

[1] Read before the Southern Surgical Association, New Orleans, December, 1919.

with a hydrocele, the differentiation will be difficult and is unimportant.

HYDROCELES CONTAINING SPERMATOZOA

The occurrence of six cases of hydroceles containing spermatozoa and of one of true spermatocele associated with a hydrocele, at the University Hospital, Baltimore, in the course of a few months, has directed my attention to this condition and has aroused my interest in it. How do the spermatozoa get into hydroceles? Is the hydrocele due to the presence of the spermatozoa, or does the hydrocele by pressure cause a communication between the seminiferous tubules and the cavity of the tunica vaginalis? I do not know of any observations that will answer these questions. It is conceivable that a trauma of the testicle could rupture tubules and permit the escape of sperm cells into the tunica vaginalis. In the cases of which I have notes, no mention is made of an injury, except in one instance, that of a man 55 years of age, who was struck on the scrotum when he was a boy. He had had a hydrocele for 40 years, but there is no way of determining how long the spermatozoa had been present in the sac.

I think it probable that in some cases, at least, true spermatoceles rupture into hydroceles and in that manner permit the ingress of spermatozoa into the sac of the tunica vaginalis. In one case there was a hydrocele with clear contents and contiguous to but not communicating with it was another cyst containing a milky looking fluid, which showed spermatozoa when examined with the microscope. It is quite possible that this cyst might have ruptured into the hydrocele, if it had remained longer without operation.

In another case, in which were evacuated 200 cubic centimeters of a slightly milky-looking fluid containing spermatozoa, several small cysts connected with the epididymis were observed. These cysts contained a similar fluid to that in the tunica vaginalis. I think it is probable that one of these small cysts had ruptured into the hydrocele.

In another case there were two sacs which communicated, one being the tunica vaginalis and the other extending up to near the external abdominal ring. This second sac may have been a true spermatocele. While the presence of spermatozoa in hydroceles is interesting, I do not know that any special significance is to be attached to this condition. The external appearance of the cyst does not differ from that of ordinary hydroceles, and the presence of the spermatozoa is only suspected when a whitish fluid is withdrawn. Possibly by transillumination, light would not show as clearly as when the sac contained straw-colored fluid. In the cases that have come to my knowledge, all were operated on under a diagnosis of hydrocele. Not always, however, is the presence of a whitish fluid in the tunica vaginalis due to spermatozoa; in some a chylocele forms, and the milky color of the fluid is due to oil globules. A microscopic examination in such a case would show oil globules and possibly filariæ as well. A remarkable case of a hydrocele containing spermatozoa was that of M. S., age 83 years, who had a very large hydrocele on the right side, which had been present for 30 years. This was tapped and 900 cubic centimeters of a whitish fluid was withdrawn. This fluid contained numerous actively motile spermatozoa. The patient's age and physical condition did not justify radical procedure and the case is noteworthy on account of the large size of the cyst, the numerous motile spermatozoa in the fluid, and the advanced age of the man.

The treatment of true spermatocele is usually excision, while that of the hydrocele containing spermatozoa is similar to that of ordinary hydroceles: excision of the tunica vaginalis, or suturing the tunica behind the testicle, or Andrews' bottle operation, etc. The results appear to be equally as good as in those of uncomplicated hydroceles.

My interest in these cases, however, is chiefly in the answer to the query: "How do the spermatozoa get into the hydroceles?"

PSEUDOMYXOMA PERITONEI IN MALE SUBJECTS

By M. G. SEELIG, M.D., F.A.C.S., St. Louis, Missouri

THERE is a sufficiently large number of recorded cases of pseudomyxoma peritonei to remove this disease from the category of rarities, nevertheless the number of studied cases is too small to furnish a satisfactory concept of the exact nature of this pathological process.

The striking, outstanding, and characterizing feature of the disease is the accumulation in the peritoneal cavity of a colloid exudate varying in consistency from a syrup to solid colloid masses. This exudate is the only constant accompaniment of the disease. In some instances there is a progressive cachexia, leading to death; in others the disease runs a benign course with perfect recovery after suitable operative procedure, and often doubtlessly without operation. In a large majority of cases the primary cause of the disease is the rupture of a pseudomucinous ovarian cyst; in a by no means small minority of cases the cause is the rupture of a mucocele of the appendix. Up to date the latter cause is the only one that has been found to be responsible for the disease as it occurs in males. In some cases the colloid material is confined in loculi whose walls are made up of a connective-tissue new-growth so firm and abundant that it fuses all the viscera into a solid mass, molded, as it were, into the peritoneal cavity. Some authors consider this process as a type of plastic foreign body peritonitis, others consider it as secondary myxomatous degeneration of the peritoneum, others as multiple cystic lymphangiomata, others as a type of innocent implantation metastasis, others as frank carcinosis peritonei, and still others as a specific type of peritoneal infection producing mucin. Virchow named the disease peritonitis gelatinosa, or peritonitis myxomatosa chronica; Péan called it maladie gélatineuse du péritoine; Vidal called it péritonite collide. Werth finally coined the term pseudomyxoma peritonei, basing it on Hammarsten's proof that the exudate was made up of pseudomucin, instead of mucin.

This by way of a short introduction suffices to emphasize both the interest that centers in the disease and the need of accurate case reports, in order to foster further study. My own experience has been limited to two cases (one of them already reported by Dr. Guthrie McConnell), occurring in male patients, with the appendix as the primary seat of the disease. I shall, therefore, limit my discussion to pseudomyxoma as it occurs in the male, appending a detailed case history and autopsy as a matter of record.

This limitation to male patients is made in order to emphasize the rôle of the appendix as a primary focus, from which as a central depôt the disease may spread to and involve the entire peritoneum.

It may be reasonably assumed that a knowledge of pseudomucinous cysts of the ovary is fairly general. The danger of rupture of this variety of cyst and likewise of the papillary cystadenomata of the ovary is almost universally appreciated, and the technique of the removal of these cysts has in late years been modified to meet these dangers. By no means may as much be said regarding the knowledge of the profession in regard to mucocele (so-called cystic degeneration of the appendix), or to diverticula of the appendix. A discussion of pseudomyxoma peritonei in the male will serve very concretely to emphasize both the importance and gravity of what we might otherwise casually consider as a mildly inconsequential appendicular lesion.

The pathology of pseudomyxoma peritonei is in the very first instance, striking, and as far as I know unique, in that the disease may run a benign or a malignant course clinically without furnishing any differentiating criteria, macroscopically or microscopically. The outstanding feature of the disease, pathologically, is the accumulation of a gelatinous material, which on analysis has been shown by Hammarsten and others, to be pseudomucin. The gelatinous material may be found circumscribed in the right iliac fossa or it may be

widely scattered throughout the peritoneal cavity. So far, no recorded case of pseudomyxoma in the male has shown any other source than the appendix as the primary source of the gelatinous material. Kaufmann, who refers to the disease as pseudomyxoma peritonei ex appendice, classifies the possible origins of the pseudomucin as from: (a) the rupture of a cystic appendix; (b) the rupture of a diverticulum of the appendix; (c) perforation of an acutely inflamed appendix. This last possibility is open to a very grave doubt for the reason that the content of an acutely ruptured appendix is purulent rather than mucinous; Elbe has shown that the essential conditions for the mucinous dilation of the appendix are a rapidly stenosing process, a sterile lumen, and an actively secreting mucosa.

The important fact is that the appendix itself is the sole responsible agent for the disease, as we encounter it in the male. It is the responsible agent, because under certain definite conditions the lumen of the appendix or diverticula therefrom contain pseudomucin and epithelial cells. It has not been established whether the escaped pseudomucin provokes a reactionary pseudomucinous peritonitis, or a myxomatous peritoneal degeneration, or whether the escaped epithelial cells are originally responsible for the pseudomucin, and continue to manufacture it after their spread and implantation throughout the peritoneal cavity. In this connection it is significant to quote the figures of Elbe showing that in 7,602 routine autopsies, cystic appendices were encountered 33 times (nearly 0.5 per cent) and that in 2,654 operations for appendicitis, cystic appendices were found 17 times (nearly 0.7 per cent).

The course of events following the escape of the pseudomucin varies.

1. The exudate may be limited in its escape, to the right iliac fossa, where it constitutes itself as a saucer-like, kidney-like or sausage-like mass, that is slowly encapsulated by connective-tissue growth. The connective-tissue growth tends from the outset to infiltrate into the mass as tiny tendrils, the tendrils growing into well-developed strands later. The mass of pseudomucin is usually coursed with fine blood vessels and frequently peppered with small hæmorrhages. The connective-tissue capsule tends to establish firm adhesion to the neighboring peritoneum.

2. The exudate may not be localized to the right iliac fossa, but may escape to various and multiple intraperitoneal sites, setting up the typical peritoneal productive reaction which results in loculation of the pseudomucin into cyst-like cavities, to which neighboring peritonealized structures become adherent. Sometimes, in this form of spread, the pseudomucin becomes delicately encapsulated and hangs from the intestinal peritoneum as little polypi.

3. It is possible for the exudate to be absorbed entirely—Lejars reports such instances and I have under observation at present a patient, who in all probability is absorbing a pseudomyxomatous mass.

4. There may be wide dissemination of the exudate with a tendency to marked secreting activity on the part of the disseminated material. These are the cases that present the clinical appearances of an ascitic abdomen, with accompanying symptoms of cachexia and general physical deterioration. In this group we may encounter infiltration of the abdominal wall. In spite of all these earmarks of malignancy, there is clear-cut clinical evidence of the benign nature of this type of the disease, in several instances. In other recorded cases, this type of the disease has carried patients off exactly as does widespread intra-abdominal carcinosis. In these cases, where the dissemination is widespread, there is an accompanying adhesive peritonitis which tends to bind and fuse all the intra-abdominal organs into an inseparable mass. Kinking of the intestine and consequent intestinal obstruction is naturally a likely complication.

From the histopathological point of view the chief interest centers around the fate of the epithelial cells which usually spread with the exudate. According to Cagnetto the contents of a cystic appendix is made up of mucus, leucocytes, and epithelial cells. The epithelial cells are usually found lining the various cyst cavities, and vary in size from low cuboidal to high cylindrical. By some authors

they are made responsible for the metastatic secretion of the pseudomucin, by others this origin of the exudate is denied. It is fairly generally conceded that as the pseudomucinous exudate accumulates within the new formed connective-tissue capsule the intracapsular pressure destroys the epithelium lining. If this is a correct assumption, it introduces an element of confusion in establishing definite criteria by which we may establish a diagnosis of carcinoma. In the present state of our knowledge, it is futile to speculate on this problem[1]. The facts are that certain cases of pseudomyxoma showing an abundant distribution of epithelium recover completely after incomplete operation, and other cases in which, it is almost impossible to find any epithelial cells, run a clinical course which is identical with that of carcinoma.

The symptomatology of the disease varies within broad limits according to the stage to which it has progressed, and the type of pathological course that it follows. It seems rational to assume that the most benign type due to a ruptured sterile appendicular cyst, may run its course symptomless, the exudate being absorbed without ever having made its presence known. There are other cases with a history of mild abdominal symptoms in which the sausage- or kidney-shaped tumor, found in the right iliac fossa, constitutes the most important symptoms. These cases shade off clinically into the more grave cases with distended abdomen, multiple palpable masses and signs of general physical deterioration. In no instance is there a satisfactory syndrome on which to base a diagnosis with any degree of assurance. In my second case I was able to make the diagnosis tentatively owing to the fact that the patient's appendix had been removed at an earlier date, for some unknown type of appendicular disease, that a postoperative fistula had established itself, and that from this fistula, when I examined the patient, there exuded a thin, mucinous exudate.

[1] This question is clouded by two case reports (Hueter and Kaufmann) in each of which, pseudomyxoma leading to death with manifest clinical evidences of cachexia, was accompanied by carcinoma of the appendix. Both these authors contend that the cases could be differentiated from colloid carcinoma of the peritoneum on the basis of scanty cell distribution. I cannot bring myself to believe that in either of these cases or in the case reported by McConnell there is sufficient warrant to exclude carcinoma.

The prognosis of the disease varies from excellent to hopeless. As a rule, it may be stated that if operative interference is instituted early before wide dissemination has occurred, a cure may be expected regularly. The widely disseminated types (irrespective of whether subsequent investigation classes this type as pseudomyxoma or as carcinoma) offer the most hopeless outlook.

Treatment consists in removing the primary focus of disease—the appendix—and scooping out that portion of the exudate which can be reached conveniently and with safety, without any attempt to clear the abdominal cavity of its entire pseudomucinous content.

The following case history is appended as a matter of record:

The patient, a male, white, 42 years old, entered City Hospital on December 12, 1912, complaining of abdominal pain, abdominal distention, weakness, and loss of weight. About 2 years ago the patient gradually developed a dull intermittent pain in the region of the umbilicus coming on about one-half hour after meals, and a feeling of discomfort between these attacks. At this time, however, there were no gastric symptoms such as pain, eructations, nausea or vomiting, and the appetite was good. The bowels were constipated, 3 days often elapsing without movement.

This condition continued with very little variation for about one-half year when, after a fishing trip, the patient returned home with a more or less severe cramp-like pain in the lower left abdomen. This lasted all day and finally compelled him to call in a doctor, who gave relief by the use of some tablets and a physic. At this time no other symptoms had developed.

Five months after this attack the patient noticed that his abdomen began to enlarge. This continued while the patient became thinner. Doctor then told patient that he had dropsy and would have to be tapped.

In October of 1912 the patient consented to an operation, which was done under an anæsthetic, and in which he presumed some fluid was removed. For 2 or 3 months previous to this operation the patient had attacks of vomiting usually in the morning, but occasionally at various times during the day. On inquiry it was learned that the operating surgeon had diagnosed the case appendicitis and had operated on that basis. Other details could not be learned from the surgeon, who had not kept a record of the patient.

The patient stated that the wound was slow to heal after the operation, and the dressings were saturated with a clear yellow fluid which looked like urine. This discharge continued for a week. Three weeks after the operation, he walked home. Still

weak at this time, he remained in bed and getting up only occasionally and becoming progressively weaker until he finally entered the City Hospital on the above date.

Family history. The patient's father is dead, the cause of death being unknown. His mother died of tumor, the nature of which is unknown. There was no history of tuberculosis, nervous or mental diseases, skin diseases, rheumatism, nephritis or cardiac conditions, etc.

Past history. The patient had measles, parotitis, and varicella in childhood. Had an attack of rheumatism 3 years ago. Had gonorrhœa once in his younger days, which was not followed by a skin eruption, sore throat, falling of hair and other symptoms of secondary lues. He had been operated upon as mentioned above. No history of any accidents.

Habits. Bowels more or less constipated. Sleeps poorly and somewhat irregularly. His occupation was that of shoeworker. Drank beer and whisky to excess some years ago but more moderately for the last few years. Used smoking tobacco. Denied the use of drugs. Diet and hygiene were found to be only fair.

Physical examination. An emaciated anæmic white male about 5 feet 10 inches tall; development and nutrition poor. No deformities, somewhat depressed both mentally and physically although apparently contented.

Head and neck. Light brown hair, gray eyes, left pupil larger than right, somewhat irregular and both reacted sluggishly to light. No nasal or oral findings. No facial palsy. The tongue was central, clear, and presented a slight, fine tremor. No cervical pulsations. Cervical lymph nodes palpable.

Thorax. Flat chest. Anteroposterior diameter somewhat diminished in proportion. Emaciation quite evident. Apex beat seen and felt in normal position. No increase in tactile fremitus. No increase or diminution in vocal fremitus. No abnormal areas of dullness or percussion. Tubular breathing throughout the thorax. No râles. No cardiac murmurs.

Abdomen. Considerably enlarged and ovoid. Firm but no marked tension. Slight tenderness on deep palpation, not well defined. On palpation the abdomen gave the impression of a general abdominal mass extending to the right and left, moderately firm in consistency, irregular and ill-defined and not very movable. No fluid percussion wave. Rectal examination elicited an ill-defined firm mass in the region of the prostate. Abdominal skin reflexes equal but somewhat sluggish. The abdominal organs could not be outlined. Inguinal glands palpable. A discharging sinus in the line of a linear scar below the umbilicus and in the midline, the discharge being yellowish in color, and mucoid in consistency.

Extremities. No deformities or paralyses. General weakness. No disturbance of skin sensations. Pulse fairly full, regular, and of good tension.

Urinalysis. Specific gravity 1,023, acid; cloudy; amber; no albumin or casts; uric acid and urate crystals.

Blood examination. Positive Wassermann reaction.

Fæcal examination. No blood observed after a meat-free diet.

Diagnosis. Syphilis malignancy(?), pseudomyxoma peritonei(?). The last two conditions are strongly suspected on account of the general condition of the patient, the abdominal physical findings, the nature of the discharge and the history of an appendectomy.

Course. Treatment was begun along a dietetic basis, efforts being made to increase the patient's resistance, hence stomachics, tonics, and a liberal diet were ordered. The sinus was regularly dressed with an aseptic dry dressing. Within a week the positive Wassermann was obtained and the mixed treatment of potassium iodide and injections of mercuric bichloride solution were instituted. At the end of a month of this treatment, patient's general condition was improved, with no marked change of the local condition.

Then salvarsan was injected intravenously which resulted in the discharge becoming more profuse for a few days but after a week the abdomen had become considerably smaller, the discharge became less and the patient generally improved.

This improvement did not last long when, at the beginning of the third month of treatment, it was noticed that both legs became more and more œdematous and finally skin excoriations were seen. The etiology of this was ascertained as disturbed circulation. In the meantime the discharge from the sinus became more profuse. About 15 days' treatment by rest in bed, elevation of the limbs, and local applications of zinc oxide ointment caused the leg condition to disappear but the discharge from the sinus became more profuse.

In a few days the patient was put into a wheel chair again but his general condition was found to be worse, with loss of appetite, pallor and emaciation more marked. Five days later the abdominal sinus became a fæcal fistula and with it came weakness and so much exhaustion that the patient was obliged again to take to his bed.

From this time on, patient became progressively weaker. Cardiac stimulation finally proved fruitless and, unable to talk from the marked weakness and collapse, the patient died of exhaustion, February 23, 1913.

Autopsy report by Dr. D. L. Harris. The body is that of an extremely emaciated white male, measuring 165 centimeters. Rigor mortis absent; livores very few in the dependent parts of the body. Eyes are deeply fallen in. Intra-ocular pressure slightly reduced; pupils equal, measuring 0.4 centimeters. Body very pale; skin over both limbs dry and scaly. Abdomen slightly distended. Umbilicus cannot be seen. In the median line about the middle of the abdomen there is an opening measuring 0.4 centimeters, oval in shape, through which greenish yel-

low semifluid, creamy-like material is exuding. On opening the abdomen, panniculus nearly absent; muscles very thin, brownish red. The abdominal cavity is filled with a greenish yellow gelatinous mass, which covers the intestines and all the organs. In the dependent parts of the pelvis and in both hypochrondria there is a considerable amount of a semifluid material of a fæculent odor and peasoup-like appearance. The viscera cannot be separated from one another; the liver is attached to the diaphragm or rather separated from the diaphragm by a thick layer of this half-translucent jelly-like material. This layer measures from 5 to 10 centimeters. The intestines are all bound together in one mass and the coils are so firmly adherent each to the other that in trying to separate them, their walls tear and fæces exude. The intestines are of a light gray, distended with gas, and very thin. Appendix cannot be seen or found. The omentum and stomach are concealed under the jelly-like mass, and the contour of the stomach cannot be felt. Bladder is distended above symphysis and is filled with clear urine. The surrounding tissue and prostate are very firm and covered by numerous yellowish white nodules, which are prominent, moderately firm in consistency, and have the size from a pinhead to a small pea. They are not transparent and appear cheesy-like. They differ very much from the translucent jelly which covers the peritoneal cavity and organs. The organs are taken out *in toto*, and large cross sections made through the entire mass. Only the kidneys could be separated from this mass. Each of these organs is very small (100 gms). Capsule strips easily, leaving a perfectly smooth surface of a reddish yellow color. The cut surface shows regular structure. Cortex and medulla are pale. Glomeruli are visible and pyramids distinct. The pelvis is moderately extended mucosa pale. On the left kidney there was found a small white nodule, measuring 1 millimeter, of a yellowish color and opaque. Spleen cannot be separated and cross sections show a very firm grayish organ, whose cut surface has a honey-combed appearanee due to very much thickened septa between which are small whitish cysts either empty or filled with the jelly-like material. The organ is very firm and cuts with difficulty.

Section through the liver shows a very thin, dark brown organ, slightly increased in consistency. The liver structure cannot be distinctly made out. The liver, as mentioned above, is surrounded by a thick layer of the jelly-like material.

Sections of the pancreas show a very firm organ, pale yellow in color, and smaller than usual. The mucosa of the stomach is pale.

On removing the sternum, both lungs are moderately contracted partly covering the heart. Pericardial sac is very thin, smooth and shining. It contains several cubic centimeters of a clear fluid.

Heart is small, much smaller than the owner's fist and weighs 190 grams. The right side is flabby; left moderately contracted. The epicardium is free, smooth and shiny, of a reddish, brownish color. The mitral scarcely admits two fingers. The tricuspid easily admits three fingers. The myocardium is brownish and measures 1.2 centimeters thick in the right side. Bicuspid and tricuspid valves are smooth and tender. The aortic cusps are tender. The wall of the aorta shows multiple irregular patches, measuring from 1 to 3 centimeters. They are prominent, white, opaque in color and not calcified. The elasticity of the aorta is still present.

Right lung weighs 370 grams; left the same. Pleural surfaces perfectly smooth. The lungs are grayish pink in the upper parts and reddish in the lower. Both organs pit on pressure. On cut surface upper lobes are grayish. Middle and lower lobes are red, congested, and on slight pressure frothy, blood-stained fluid is exuding in abundance. Bronchi moderately congested, filled with frothy fluid. Bronchial glands are not enlarged and slightly anthracotic.

Brain. Dura mater of a good tension; gyri are not flattened. Ventricles contain usual amount of clear liquor. Consistency of the organ not diminished. On cutting, tissue appears rather pale and blood points are not numerous.

Anatomical diagnosis. Pseudomyxoma peritonei; peritonitis chronica (with purulent and fæcal exudate in abdomen); brown atrophy of the heart; early arteriosclerosis of aorta; œdema of the lungs.

Microscopical findings. Sections from the omentum, intestine, spleen, kidneys, liver, pancreas, bladder, and diaphragm, and from the lungs and heart were made. Microscopical examinations of these show the process to involve only the peritoneum and the parenchyma of the spleen. Within the substance of the liver, kidney, and pancreas, there is none of the myxomatous material. The process does not extend beneath the visceral peritoneal layer of the intestines.

Sections of the omentum show a marked fibrous connective-tissue proliferation with numerous areas of extensive lymphatic infiltration. Covering this in varying degrees of thickness are laminated, cell-free layers of unformed material which stain faintly and diffusely. Numerous cysts here and there are lined with a single layer of epithelial cells which, in proportion to the distention, are either tall, columnar, cuboidal or flattened. These epithelial cells may be found in all degrees of deterioration. In larger cysts where the stratified myxomatous material is more extensive, only the faint outline of these cells is discernible.

In one section, which included the liver, the diaphragm and the thickened intraperitoneal deposit, Glisson's capsule and the peritoneum covering the liver is easily made out. Upon this, lying within the fibrous tissue bands, are small cysts containing within their walls the mucinous deposit. These cysts are lined with a single layer of cuboidal and columnar epithelial cells.

In the omentum there is an extensive deposit of the mucinous material held within a connective-tissue meshwork. There are here numerous areas of

lymphatic infiltration. The spleen can scarcely be recognized; only a few scattered islands of lymphoid tissue mark its site. The fibrous connective tissue in-growth is here especially marked.

The epithelial cells lining the cysts are preserved only here and there. For the most part merely a faint and obliterated outline of these cells remains. It appears that degeneration follows as rapidly as proliferation advances and that in this we have one explanation of the chronic nature of the disease.

These cuboidal epithelial cells are always in a single layer and do not grow upon stalks or tend to form papillary outgrowths. Very few goblet cells were observed.

THE PELVIC ARTICULATIONS DURING PREGNANCY, LABOR, AND THE PUERPERIUM

An X-ray Study[1]

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THE question as to whether a woman's pelvic girdle expands in pregnancy and labor has been a matter of interest since earliest time. The belief that it separates has had many advocates and has been confirmed by many positive reports by earlier observers. Quite likely the majority of these were pathological cases, yet there is no doubt but that joint changes greatly aid labor in some of the animals.

As early as 1812 Le Gallois showed that the pelvis of the female guinea pig was only about half the size of the fœtal head and that parturition was possible only by an increase in size of the pelvis since the head measured 20 millimeters and the pelvis but 11 millimeters. He showed that 3 weeks before parturition, the ligaments joining the pubis became thick, soft, and malleable so that the pubes gradually opened, the ilia swinging on the relaxed uterosacral joints as if on a hinge. At time of parturition, there was a separation of at least one finger's breadth and very often two. Immediately after delivery, the shrinkage began, and the symphysis in a few days receded to normal width and consistency. Knox, in 1839, observed in a pregnant seal a separation of the symphysis pubis and elongation of its ligaments to the extent of nearly 2 inches. Barlow, in 1854, described changes in the pelvic joints of the parturient cow which increased the size of the pelvis, and Duncan later demonstrated these specimens before the Edinburgh Obstetrical Society. The pubes remained fairly well held together and the changes were chiefly in the sacro-iliac joints. The sacro-iliac joints in the non-pregnant animal are firmly bound by a substance resembling intervertebral discs, yet in pregnancy the bony surfaces become smooth and lubricated and the surrounding fibrous ligaments markedly relaxed. The sacro-iliac ligaments of moderate thickness and in a state of tension in the non-pregnant cow were much longer and thicker in the pregnant animal and with such lack of tension as to permit the sacrum to move quite freely upon the ilia, and vice versa in an anteroposterior direction and to allow the ilia to separate behind. The fact that the cow's rump changes its plane a few days before labor has long been known to cattle raisers.

It seems quite likely that similar observations were responsible for the Hippocratic doctrine that a woman's pelvis separated in her first labor and remained so thereafter. The majority of texts state that Vesalius did much to overthrow this doctrine by his dissections, in which he demonstrated that it was impossible for the pelvis so to widen, as did Realdus Columbus who claimed that woman's pelvis was an unyielding ring. Yet we find from the literature that these observations made little impression for more than a century, possibly because Severin Pineau in 1599 described a separation in the pubis of a woman who suffered punishment by death 10 days postpartum, for the murder of her

[1] From the Women's Clinic, University of California Hospital, San Francisco; read at the American Gynecological Society, June 14, 1919.

Fig. 1. Non-pregnant control, virgin pelvis.

child. The dissection done in the presence of Ambrose Pare proved the plausibility of the older tenet to their complete satisfaction.

The weight of Pare's authority and the value of positive evidence prevailed. The majority believed that Vesalius and Columbus had dissected cases against the rule. It appears that of the obstetricians of the 17th and first half of the 18th century, Mauriceau alone rejected the Hippocratic doctrine. The pelvis is so small, writes Pare: how can a baby come through so small a space unless the pelvis yields?

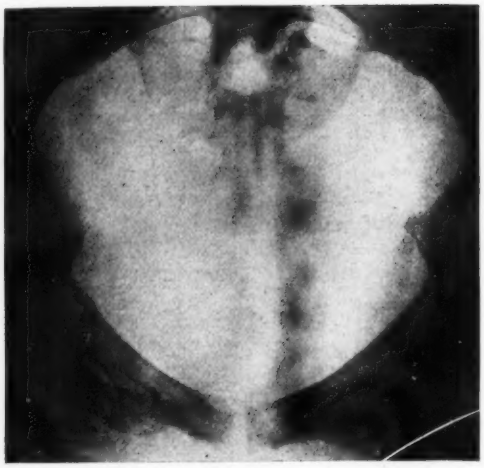

Fig. 3. Non-pregnant control, II-para. Symphysis ruptured at first labor, low forceps delivery. Patient in bed three months, crutches nine months, cane until 2 years. Symptoms extremely marked after fifth month of second pregnancy, 3 years after first labor. Plate 15 months after second labor when very slight symptoms present when patient turned suddenly.

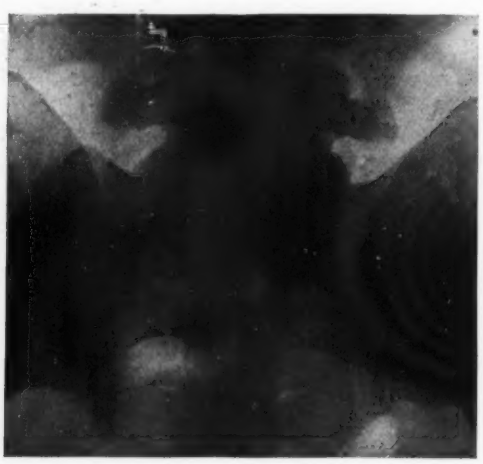

Fig. 2. Non-pregnant control, virgin pelvis. Sacro-iliac symptoms.

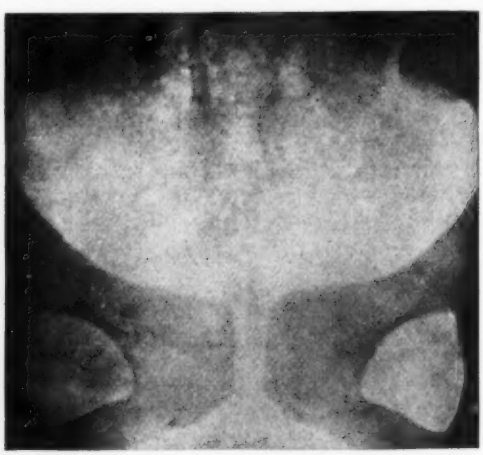

Fig. 4. Pregnant control, 16-year nullipara, at 4 months. Sacro-iliac symptoms. Wide sacro-iliac synchondrosis.

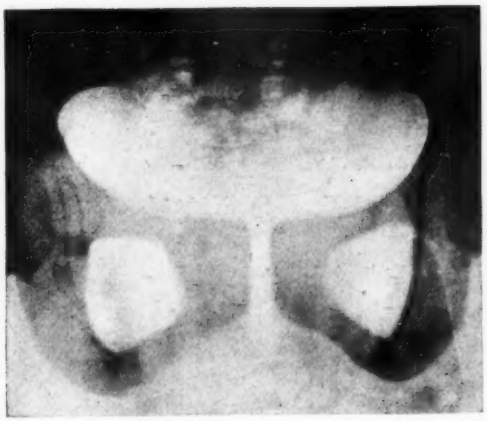

Fig. 5. Pregnant control. Wide rachitic pelvis. Has had one cæsarean section. Now 4 months in second pregnancy.

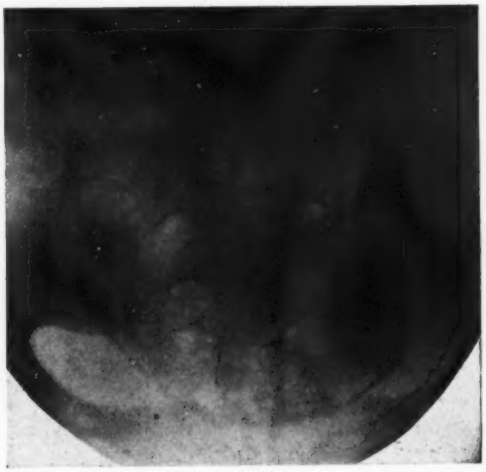

Fig. 6. Pregnant control. Nullipara, 12 days before labor.

With the long and bitter controversy waged concerning the justifiability of symphysiotomy, the subject gained new importance. Its earlier advocates believed that the operation was indicated when the pelvis did not properly give during labor.

Our modern belief was first well stated by Baudelocque who admitted that the pelvis occasionally separated, as was evidenced by the reports of many positive cases, but denied that it did so as a rule, since he sought it unsuccessfully in the fresh bodies of twenty women who died following labor. Since considerable separation did not occur as the rule, he deemed that a smaller one would not aid labor materially since a pubic separation of one inch added only two or three lines to the essential pelvic diameters.

Nor did Smellie believe it was a frequent occurrence. He cites one case in his text in which symptoms attended the pubic separation, disappearing 2 months following labor, a case related to him by Smollett. He says in discussion that he himself had never seen such a case but that Lawrence had a specimen, the pelvic bones of which were separated one inch from each other, and that he had seen one other such specimen owned by Dr. Hunter. The view that the pelvis actually opened, lost ground. "Will not the fœtal head" writes Roederer, "give sooner than the pelvis?"

Yet the literature prior to that time cites many positive cases. Spigelius, Bauhineus Riveamus, Diemerbroeck, Arniseus, Bianchi, Gregory Pineus, Duvernay, Bertin, Levret, Santorini, Hunter, and others had recorded a separation of the pubis in dead parturient women. Hildanus, Guillemeau, Van Solingen, Puzos, Veslingries, Soumain, Bikker, Arnauld, Morgagni, Madame Boivin, Madame La-

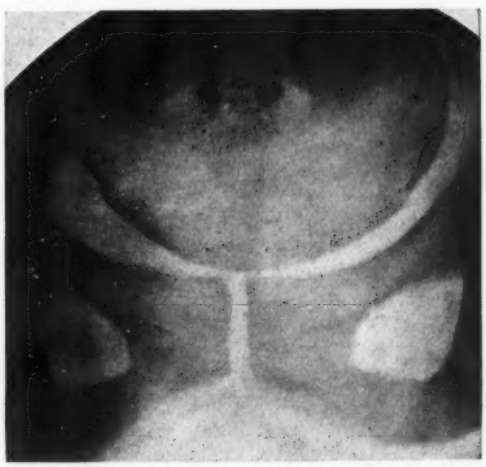

Fig. 7. Labor and puerperium. I-para. First stage of labor.

Fig. 8. Labor and puerperium. I-para. Three weeks after first labor.

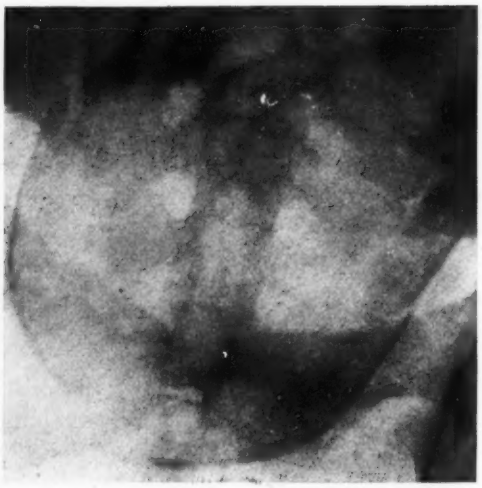

Fig. 9. Labor and puerperium. Nullipara. Second stage. Wide sacro-iliacs and rather wide symphysis.

chapelle, Jacquémier, and others made similar reports from the living subject. Pare, Peu, Lachapelle and Smellie record the separation of one ilium from the sacrum, while Breit reported similar dislocations in both sides.

Fig. 10. Labor and puerperium. Six weeks after labor.

Sufficient examples of pelvic separation had been reported to excite interest in its mechanism. The older observers usually regarded the symphysis pubis as a fibrocartilaginous joint very often without mention of binding ligaments and considered the accumulations of fluid in its center as degenerations. Yet Albinus, when in Leyden, classed both the symphysis pubis and sacro-iliac joints as bone joints lined with synovial membrane. William Hunter independently about the same time came to the same conclusion and showed that in parturient women a membrane often extended over nearly the entire articulation and contained fluid. One hundred years later, Senoir advanced similar views before the Paris Academy contending, as did Hunter, that an effusion of serum caused the separation of the bones and relaxation of the ligaments, and that the joints were lined with synovial membrane. Luschka, in 1854, made similar observations, recording the contrasting pictures of the pelvic joints of two women of 21, one non-pregnant and the other recently delivered, as well as the report of the findings of a woman of 36 who died late in pregnancy.

Fig. 11. Labor only. Nullipara, second stage, head on perineum, wide sacro-iliacs.

Yet the whole subject of the behavior of the pelvic joints in pregnancy and labor is best summed up in Duncan's essay in 1867. He emphasized the error of teaching that the pelvis is immobile since the sacrum normally rotates within small limits on a transverse diameter. This mutation of the sacrum occurs in men and women. When standing, the body weight pushes the promontory backward, thus increasing the length of the conjugate vera. When squatting, the promontory is shoved forward and the coccyx backward, thus increasing the diameter of the outlet. With the softening of the pelvic joints, which occurs normally during pregnancy, the movements of the sacrum are increased. Nature utilizes them to aid labor and guides the woman in the first stage to walk about to increase the inlet while the head is high. When the presenting part reaches the pelvic floor, the reflexes cause the patient to draw up her knees and press down. The contracting abdominal muscles pull the pubis up and thus increase the outlet. Moreover they push with their feet wide apart in a position to take advantage of any separation of the pubis. His dissertation clearly explains the value of

Fig. 12. Nullipara, generally contracted pelvis. Head low on spines, cervix 6 centimeters, some overlapping of fœtal head.

the so-called Italian position which was in use for many centuries before and which was described by Walcher.

Poullet, in 1864, made some observations to determine the force necessary to rupture the symphysis pubis and found that the pubic joint of seven women who died during the puerperium broke under forces of 170 to 200 kilograms. Since forceps extractions usually require less than 25 kilograms, it is apparent that the softening of the joints is an

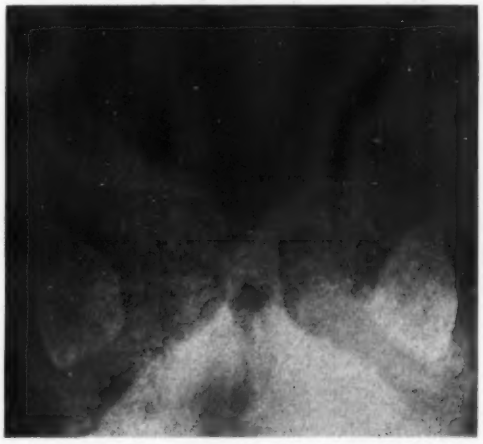

Fig. 13. Eighteen-year old primipara with wide symphysis. X-ray taken early in labor. Symphysis returned to normal size 18 months after labor.

Fig. 14. Eighteen-year old primipara with wide symphysis, returning to normal size 18 months after labor. X-ray taken 45 days after labor. Symphysis still wide but narrower than in Figure 13.

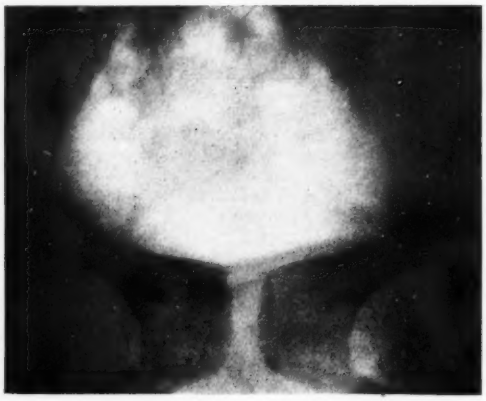

Fig. 15. Eighteen-year old primipara with wide symphysis, returning to normal size 18 months after labor, X-ray taken 45 days after labor. Labor shown in Figure 13. Symphysis now has returned to normal limits.

etiological feature in rupture of the symphysis during labor.

The observations of Budin that the symphysis is mobile during pregnancy have been confirmed by a host of observers, and Cantin's observations are of interest in showing the amount of separation present in a series of Cantin in 500 cases found an increased mobility over that of non-pregnant controls in all but 2 per cent of cases. Yet the pubis was not separated more than 3 millimeters in any of his series, and only in 16 per cent was it more than 1 millimeter. Symptoms were present in 15 per cent of the total and 70 per cent of those giving symptoms had changes in their gait. The recent work of Goldthwaite is known to all.

My study has developed from observations in an effort to use the X-ray for diagnostic aid in gynecology and obstetrics as well as from interest in a case of rupture of the symphysis during labor which came under my care 3 years later with marked symptoms in her second pregnancy; and by the great number of sacro-iliac slips seen in my service in spite of proper corseting. Since we are not aware of a series of X-ray studies of pelvic articulations, we have investigated a series of cases. It is difficult to present conclusions because of the constant chance of error in deductions from the X-ray plate. Only one woman studied has had marked widening of the symphysis during pregnancy, with a return to normal limits when seen 15 months later. It appears, however, as if the widening of the sacrosciatic spaces was almost a constant phenomenon.

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TUBERCULOSIS OF THE JOINTS

ROLLIER'S HELIOTHERAPY[1]

BY GUSTAV SCHWYZER, M.D., F.A.C.S., MINNEAPOLIS, MINNESOTA

WE realize that a large amount of material should be the foundation for conclusions in such a vast subject as joint tuberculosis. It is, therefore, with some hesitancy that I bring before you my small amount of operative work on such cases. Still some valuable deductions at times may come from a limited number of cases as we observe them in private practice.

The study of the different phases of tuberculous joints is so extensive that we can only touch upon the most important features.

Etiology. The two main channels by which the human body becomes infected with tuberculosis are: the lungs and the alimentary canal.

In children, Fraser has found 60 per cent of all the joint tuberculosis to be of bovine type, an infection directly traced to tuberculous cow-milk. The alimentary route in children, therefore, is predominant.

In adults the bovine infection becomes negligible. The tuberculous infection of the joints is here of more secondary nature; in the lungs we have to look for the probably primary focus.

Of less importance are the channels for tuberculous infection from the tonsils, from the pharyngeal mucous lining, and infected gum tissue. They are the direct source of lymph-gland infection in the neck.

Joint tuberculosis is prevalent in the first two decades of life.

The question whether trauma is an etiological factor for the start of the disease has given rise to much dispute. Not only do we find almost constantly a minor trauma mentioned by the patient in the history of the sickness, but also experiments point to the fact that traumata, and surprisingly often light ones, have a distinct significance in the start of the disease (Krause, Pietrzikowski, etc. cited by Fraser). It is obvious that a previously dormant tuberculosis of a joint when exposed to injury may progress to an acute state.

The hip and knee joints are most frequently affected by tuberculosis; the elbow, ankle, wrist, and shoulder follow in frequency as enumerated.

Pathology. There are two principal types of infections to be considered: one an invasion from a nearby bone-focus; the other through the capsule from a tuberculous focus in the neighborhood, especially tuberculous synovitis.

The most frequent is the infection of the joint from the side of the bone. Years ago Volkmann said that in children the tuberculous arthritis always starts from an osteitis, respectively osteomyelitis, and even Koenig in his monograph on coxitis avoids speaking of a primary and secondary synovitis. Still he admits that he has seen cases of simple tuberculous synovitis in children. The start of the arthritis is then overwhelmingly from a bone-focus. This focus may for some reason become walled-off by osteosclerosis.

We have observed such a case in the upper epiphysis of the tibia in a girl of 16. The X-rays showed us a well defined focus in the bone, of the size of a hazelnut. Early operation brought on a definite cure and the imminent joint tuberculosis was thereby prevented. The process in the bone during 14 years of observation has not recurred to date.

If contrary to this the process in the bone is of more acute, more violent character, this osteomyelitis spreads rapidly; great rarefaction of the bone takes place; the bone lamellæ become destroyed; they are replaced by tuberculous granulations; and caseation and necrosis set in.

This can lead to a secreting fistula toward the outside, or the process can perforate into the joint. In this latter case, erosion and perforation of the cartilaginous covering of

[1] Read before the Western Surgical Association, Kansas City, December 5, 1919.

the bone follows, and the joint cavity has to surrender to the entering tuberculous infection.

On the other hand, the primary tuberculous synovitis, also called synovitis fungosa granulosa (the white swelling-tumor albus), is of a more chronic character. It has a greater tendency to heal, especially in children.

Numerous, distinct tubercles form in the synovialis which is ultimately replaced by tuberculous granulations. In lighter forms of infection, the joint contains a serous hydrops (Koenig). The fluid is yellowish and clear. Here conditions can remain unchanged for a long period of time. White flakes in that hydrops are fibrinous deposits (hydrops fibrinosus). At times we find rice-bodies, probably originating from this fibrin.

In the tuberculous process the cartilage does not take an active part.

The peculiar white swelling, so characteristic in the knee and elbow joints that the diagnosis often can be made *prima vista*, is due to hyperplasia and infiltration, not only involving the capsule, the ligaments, and the tendon sheaths, but also the subcutaneous tissue.

The tuberculous granulations can spread into the surrounding tissue outside of the joint proper. If they undergo caseous or purulent degeneration, cold abscesses or fistulæ will result. Such abscesses have become significant for the diagnosis, as in psoas abscess. If in coxitis we find an abscess at the groin and upward from it, the bone-focus lies in the acetabulum, while an abscess directly in front of the hip-joint tells us that the focus is in the femur.

For the knee the formation of bulky masses of fungous granulation tissue on the capsule is a characteristic and outstanding feature for this joint. The elbow and shoulder joints are more frequently the seat of caries sicca. The hip-joint infection is characterized by a particularly great destruction of bone tissue, of the femur head, and of the acetabulum.

Our cases of joint tuberculosis were of a distinctly advanced character. Conservative treatment had failed to bring on a cure. We were compelled to do extensive arthrectomies and resections in all of our cases.

In every case the pre-operative diagnosis was established beyond a doubt. We will merely mention that radiography and at times the subcutaneous tuberculin test always allowed definite conclusions.

TREATMENT IMMEDIATELY PRECEDING OPERATION

We are holding the view that a general preparatory treatment has to precede operations, regardless of the mode and length of time of the previous conservative treatment. By this we aim at an improvement of the resistance of the body in general, providing for fresh-air and light; we encourage the patient's appetite as much as possible in order that a large amount of substantial food will be taken. In the majority of our cases Sahli's tuberculin treatment was given.[1] This preparatory period extending from 1 week to 2 months gives us a good chance for closer observation of the patient. We must obtain a very exact knowledge especially of his lungs and kidneys, furthermore an exact temperature picture which is of additional value for comparison later on. Very accurate notes should be taken, telling us as much as possible of the clinical pathology of the diseased joint. We must try to locate the bone-foci. We must thoroughly test the function of the joint actively and passively. In young people the examination is often hampered by lack of self-control or by involuntary muscular contraction. In these cases a general anæsthesia for the examination is recommendable.

X-ray examination is, of course, indispensable.

PREPARATION FOR OPERATION

The preparation for operation has always been done with a view to ascertain an ideal asepsis. The field of operation is carefully shaved, and the covering skin surgically prepared the day previous to the operation. The patient arrives at the operating room with an aseptic dressing covering a wide area.

It is our practice to operate upon such joints under Esmarch constriction wherever feasible.

[1] We carefully followed his instructions, avoiding any elevation of temperature which in our estimation can safely be done by using Sahli's tuberculin prepared in the hands of Dr. Beraneck, at Neuchatel.

Only with this bloodless procedure under Esmarch are we able to differentiate between healthy and diseased tissues, particularly bone tissue.

OPERATIVE PROCEDURE

As to the methods of operating, incision and so on, we can briefly say that we generally followed Kocher's ways. We always were impressed that through his incisions good access could be gained to the entire diseased area, and it is most important that all the tuberculous tissue be carefully excised by exact dissection.

If the disease is confined purely to the synovial membrane of the joint, we limit our work entirely to the removal of this membrane, thus avoiding complete ankylosis. But if the bone is involved, the bone ends are exposed by energetic dislocation. We strip back the healthy, outer integuments and turn them back like the cuff of a sleeve. Now the diseased part of the bone is cleanly removed. If we aim at a complete ankylosis, a good apposition of the bones is imperative.

In every case we have used iodoform powder. Contrary to the general routine, we prepared the iodoform powder previously by boiling the same for half an hour in a 1:500 bichloride solution. This powder is rubbed into the entire wound surface, the bone, and the soft tissues. The superfluous, loose part of it is washed away with saline solution. Thus we always have avoided dangerous degrees of iodoform intoxication.

In all our resections we drained the wound cavities with rubber tubes surrounded by washed-out iodoform gauze strips. Our buried suture material consisted of silk and linen. Silkworm-gut is the best material for the surface. An abundant amount of absorbant gauze and cotton is used for dressing. A plaster-of-Paris cast is put on before the Esmarch bandage is released. The drains are removed through windows in the cast within a week.

Though the bleeding into the cast was often considerable, we never noticed any alarming hæmorrhage. The first cast was always made quite heavy with the intention to leave it on from 4 to 6 weeks. After that time the wounds were closed and in affections of the lower extremity the patient was allowed to leave the bed in a lighter cast. None of our hip or knee resections remained in bed longer than 6 weeks. The patient was sent home in the second cast with the advice to return in 2 to 3 months. A much shorter time is needed following operation on the upper extremities.

Fortunately in all our cases we did not have to resort to amputation. Only one case left with a fistula after a resection of the elbow-joint. A second resection 11 months later brought on a definite cure also in this case.

REVIEW OF THE CASES

CASE 1. Mrs. Maud R., age 24. Resection of right middle metacarpophalangeal joint and removal of the corresponding metacarpal bone. The patient insisted on keeping her middle finger on account of appearances and the result showed that this finger without any metacarpal bone back of it did not become an obstacle in the usefulness of the hand. Wound healing was prompt. A year later a tuberculous tendovaginitis developed on the dorsal side of wrist of same hand, was surgically treated. Since then (six and one-half years) there has been no recurrence of tuberculosis.

CASE 2. Edward C., age 20. Tuberculous wrist of the right hand. Resection. The family history is negative. A year previously there was serious lung involvement with hæmorrhages. The pulmonary condition is now quiescent; no fever.

Slight injury in form of a twist of the hand is mentioned as the beginning of the trouble. The function gradually became limited, and the hand slightly flexed. The wrist was swollen, extremely painful to touch, with no active movements; pressure on ends of ulnar and radial bones and carpus is very painful. He is unable to close the hand or straighten the fingers; he is unable to hold a pen in the hand. There is no fistula.

Through a Langenbeck's dorsal incision the diseased carpus was removed, leaving only the pisiform and multangulum majus. The ends of the radial and ulnar bones were also removed on account of caries. A splint was applied with the hand in strong dorsal flexion. Recovery was uneventful. The patient was able to hold a pen in his hand when he left the hospital 4 weeks after operation. A splint was used for another 6 weeks. After this, the hand was in useful condition and was painless.

The patient contracted a cold 6 months later, and died from pulmonary hæmorrhage.

CASE 3. Mrs. Sarah L., age 50, had a tuberculous elbow of the left arm. The family history reveals no tuberculosis. The patient was formerly a strong woman, the mother of 10 children. In August, 1903, she wrenched her elbow in wringing out a

Fig. 1. Case 12. Resection of tuberculous knee-joint in Mrs. W., aged 58.

heavy garment. Since then movement in the elbow has been limited. Eight months later, April, 1904, the patient suffered a second trauma. She fell striking her elbow against a fencepost. Three weeks later a discharging fistula developed at the outer side of the elbow. The fistula closed spontaneously a few weeks later. There was a gradual increase of pain, and more marked limitation of motion.

Status. In June, 1906, she presented a much thickened left elbow, with striking atrophy of the upper and forearm muscles. Elbow at right angle; fore-arm in pronation. There was a large fistula behind the inner epicondyle of the humerus. There was only 7 degrees active motion in the sense of flexion; about 10 degrees active supination, quite painful. Pressure on the olecranon and the head of the radius was very painful; less on epicondyles of humerus.

A typical resection of the elbow through Kocher's outer incision was done July 4, 1906. There was abundant tuberculous granulations in the joint; the cartilage of the three bones was mostly destroyed. The bone-ends were carious. An irregular sequestrum of hazelnut size was removed from the middle of the epiphysis of the humerus. The bones were wired. Healing with outer and inner fistula. Result: flail joint.

A second resection was done 11 months later, June 11, 1907. There were no more granulations in the joint, but caries of humerus and fore-arm bones. Again the bones were wired. The wound healed perfectly, and has remained without fistula until today. She has an astonishingly useful joint although still too loose. She does all her house and garden work, and feels very much benefited by the operation. She has gained 25 pounds.

Cases 4 and 5 are patients with resections of the ankle-joint. In Case 4, a girl of 12 years, the immediate results on one side and six months later, on the other side were beyond reproach, but the girl died 4 months after the second operation, from meningitis.

Case 5. The other case of resection of the ankle-joint, is that of a 14 year old boy. The result was more gratifying. Here we removed the entire astragalus, in addition to the epiphyseal ends of tibia and fibula. The young man was seen 6 years later, and although limping somewhat on account of the shortening, he could walk freely without any pains.

Case 6. Viola G., age 4, presented tuberculosis of the tarsometatarsal joints. Two fistulæ existed. The little girl was unable to step on her foot. Through two side incisions we gained access to the middle of foot, removed the ends of the astragalus and calcaneus and the entire middle foot, including the base of the metatarsal bones, thus bringing the front part of the foot in contact with the heel-bone, and the astragalus. The result was a striking one, not only did the wound heal without fistulæ, but the girl who is now a young lady of 20 presented to us about a year ago a well formed and useful foot, though of course shorter than the other. She walked without limping.

Cases 7, 8, and 9 had tuberculous coxitis. Within 8 weeks after the operation they were all up and about on crutches. Having been city hospital cases we were unfortunately unable to follow them up.

Case 7, a boy of 16, had an extensive synovitis and partial destruction of the femur head.

Case 8, a girl of 13, with a previous conservative treatment of over one year, had extensive bone destruction of the head of the femur and acetabulum; the latter perforated in two places. The patient was walking on crutches 6 weeks later.

Case 9, Tilda S., age 8, had a negative family history. She was ill nearly two years. She was treated conservatively for 7 months. As the case is of special interest, a somewhat detailed report follows. She had a noticeable deformity of the right hip with a swelling above and behind. The right superior anterior spine was 1 inch lower than the left when the patient lay flat on her back. The right trochanter appeared flattened on account of the swelling. The right groin has a chain of swollen glands. Active movements in hip-joint are absent. When lifted on her feet the child cries out in agony. Examination by rectum shows a very painful region of the acetabulum and some softening.

Examination under anæsthesia: Rectal examination repeated. We recognize a distinct gland of the size of a peanut directly above the acetabulum. We find both trochanters in equal distance from the corresponding anterior spines. The right knee somewhat stiffened, is easily loosened; the joint is otherwise normal. There is a slight pes equinus. In flexing the right femur we notice a bony crepitation. Flexion of the femur up to 90 degrees and full extension are possible; rotation to about 20 degrees; abduction 5 degrees; no adduction. All this is possible in narcosis. The leg is 3 centimeters shorter than the other.

Fresh air and tuberculin treatment for about 6 weeks, precedes the operation.

Operation, October 9, 1907. Kocher's angular incision. An abscess in the gluteal region was found before incising the capsule (bursitis glutæi maximi). After the capsule was opened, we found the inflamed

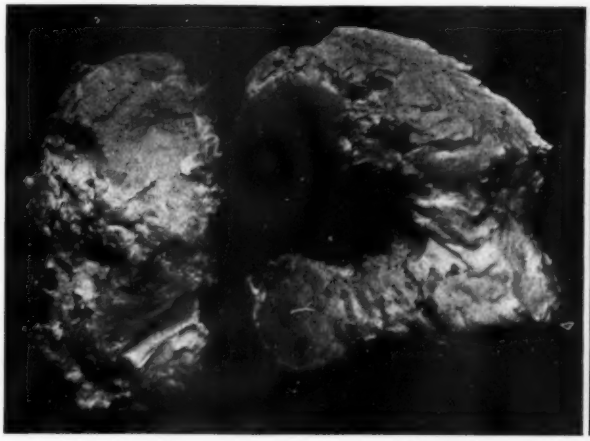


Fig. 2.

Fig. 2. Case 11. Resection of tuberculous knee-joint in Mr. A., aged 33.

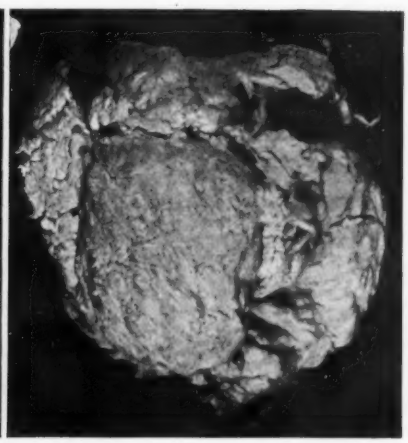


Fig. 3.

Fig. 3. Case 11. Knee-cap with tuberculous fungi.

synovial membrane thickened with granulations. The bone destruction was very marked. There was no cartilage anywhere,the socket seemed to be a good deal deeper than normal. In its middle we found a softened place of the size of a peanut, filled with granulations, evidently a perforation which admitted the tip of the little finger. There was another smaller perforation at the lower border of the acetabulum. The ligamentum teres showed partial destruction, and was therefore removed. The synovial membrane including the diseased capsule and all the carious bone tissue of the acetabulum and head of femur was carefully removed. Iodoform powder was rubbed into all the pockets, and its surplus washed away. Iodoform gauze drainage was placed in the perforation of the acetabulum and drainage established in front of and behind the head of the femur. The wound was closed in the usual way. A plaster-of-Paris cast was placed from the knees upward, including the pelvis. Both legs were extended in abduction.

Nine weeks after the operation, although, of course, the patient has a stiff joint, he walks without crutches, without assistance, and without pain.

Cases 10, 11, 12, and 13 form a group of typical knee-joint tuberculous infections.

Case 10, Lizzie B., a girl of 17, is especially characteristic for a tuberculous synovitis of the entire joint without involvement of the bones. As the case made an uneventful recovery, left the hospital in 3 weeks, remained well until now, that is for 20 years, and has retained a partial function of the knee-joint so that she walks practically without limping, it will prove to us that a primary synovial tuberculosis does exist and that here an arthrectomy with removal of the entire synovial membrane leaving the bones and cartilage intact can be of great advantage.

We proceeded as follows: Lateral, longitudinal incision, chiseling off the insertion of the patellar ligament with the tuberosity of the tibia and also detaching with a chisel the insertions of both lateral ligaments with the epicondyles, thus giving a perfect access to the joint. Contrary to the procedure of resection of the joint where the capsule is incised at the start, we removed the entire diseased capsule, as much as possible *in toto* starting on the outer side of femur, and opening the joint cavity as late in the procedure as feasible. The entire capsule was thus dissected away. The menisci were removed together with the capsule. But the cruciform ligaments were saved, requiring a careful dissection of the synovial membrane which was wrapped around these ligaments. In this way the result was a fibrous ankylosis of the joint with a partially preserved function.

Cases 11, 12 and 13 showed bone involvement of the tibia and femur and required a resection of the epiphyseal ends.

Case 11. Alfred A., age 33, was operated upon August 4, 1910, for tuberculosis of the left knee. Healing took place within 4 weeks. After this another lighter cast was applied for 2 more months. Perfect ankylosis resulted. We heard from the patient in 1917 and again now. Previous to the operation the man was unable to make a living on his farm due to the severe pains in the knee. He now writes, 9 years after the operation, that he does all his farmwork without the least discomfort.

Case 12, Mrs. Mary W., age 58, was operated on August 5, 1916, for tuberculosis of the left knee. The case is of interest because of her age. The

Fig. 4.

Fig. 4. Case 13. Resection of knee-joint for advanced tuberculosis in Mrs. A., aged 25.

Fig. 5.

Fig. 5. Case 13. Eroded knee-cap.

infection had started after trauma. The bones were less diseased than in the previous case. Healing took place with perfect ankylosis. A report from her a year later was good and exceedingly cheerful.

Case 13, Mrs. Magnil A., age 25, was operated on December 6, 1917, for tuberculosis of the right knee. The sickness extended over many years. She came to us on crutches with the knee flexed, unable to step on the foot. The long standing of the disease probably explains the extensive destruction of both bones, more so than in any of our previously mentioned cases. As the patient was a frail individual with a positive family history and having had one child, we performed 4 months later the operation for sterilization. In a recent letter she states that she enjoys excellent health.

ROLLIER'S HELIOTHERAPY.

European surgeons of late years have given Rollier's heliotherapeutic treatment for surgical tuberculosis due consideration. Men, like Bardenheuer, after personal inspection of the hospitals at Leysin, have become very enthusiastic about the treatment. De Quervain, in Berne, as a leader, advocates the view that heliotherapy applied in the sense of Rollier is taking the place of bloody operations for closed surgical tuberculosis.

We have learned that Rollier's treatment is being used, and apparently with success, at the Adam Memorial Hospital at Prysburg, New York.

For those who are less familiar with Rollier's sun-treatment, I will say that sun-rays are combined with open-air treatment at an altitude of from 3,500 feet to 5,000 feet. I can only briefly state that the body of the patient is cautiously, that is very gradually allowed to be influenced by these solar rays as well as by the open air. It is astonishing how the body, which at first is exposed to the rays for only a few minutes a day, can stand later on the solar rays for hours. Complications of the skin, headaches, and tachycardia are cautiously avoided. The skin soon becomes tanned. It changes from a light brown into a deep copper color. It is characteristic that the dark complected individual tans deeper and that his prognosis is better. The immobilization of the joints is done only when needed and then only by removable splints and extensions not interfering with the treatment.

The sun rays show their beneficial influence within days and the analgesic action is striking. Rollier's statistics show that uncomplicated, closed tuberculosis of the joints is definitely and permanently cured within 2 to 3 years with a *restitutio ad integrum.*

Fig. 6.

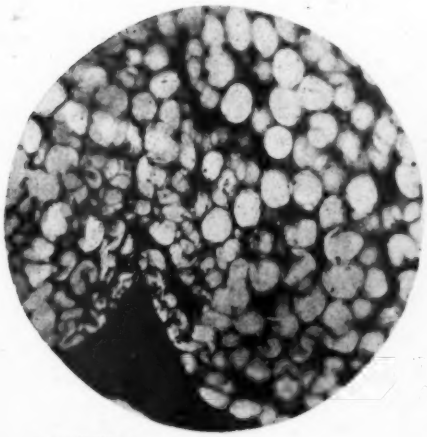
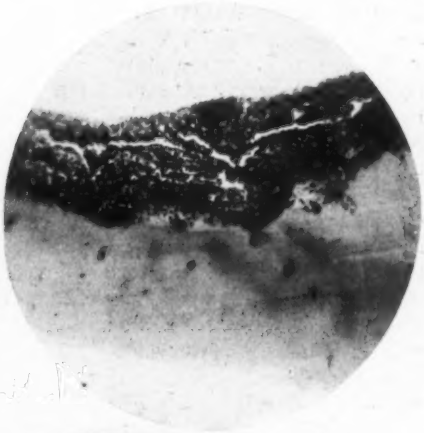


Fig. 7.



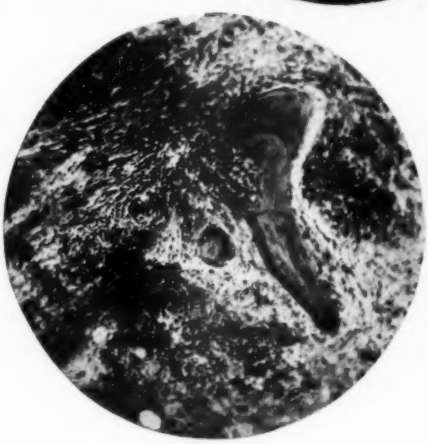


Fig. 8.

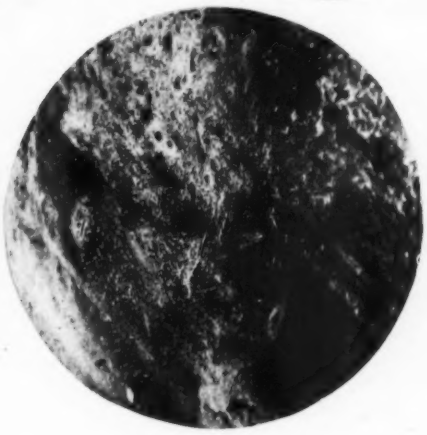


Fig. 9.

Fig. 6. Case 13. Leucocyte infiltration in superficial fat layer.
Fig. 7. Case 13. Area of necrotic cartilage.
Fig. 8. Case 13. Tuberculous osteitis, partial necrosis of bone tissue, giant cell.
Fig. 9. Case 13. Extensive bone necrosis.

De Quervain says that the treatment with the alpine solar rays for surgical tuberculosis in the human has ceased to be an experiment.

Though Rollier speaks of an analgesic, a bactericidal, and a sclerogenetic action of the solar rays, a clear understanding of the theoretic side concerning the most important points of the sun rays and their influence upon the human body has not as yet been reached. We do not know how deep the sun rays enter into the human body and we are left in the dark as to their action upon the tissue cell.

The sun rays are divided into two classes: long-waved and short waved ones. In the latter group belong the ultraviolet rays. This portion of the spectrum of the sunlight is the therapeutically active one. These rays are the cause of the pigmentation of the skin. They differ in action and influence in different altitudes. In the lower altitudes, contrary to the higher altitudes, these shorter waves (the

ultraviolet ones) are principally absorbed by the denser atmosphere that contains more dust and moisture.

It remains for us to state that Rollier is earnestly attempting to create a scientific basis for the heliotherapy. As former assistant of Kocher he does not discredit the employment of operative procedures in the treatment of tuberculosis when such measures cannot be avoided. The difficulties he encounters are the same as ours; the open tuberculosis brought on through negligence or ignorance. And if he decries opening tuberculous foci under any but the strictest aseptic conditions, we must heartily agree with him.

No doubt it would be taking another great step ahead in the treatment of surgical tuberculosis to establish numerous institutions in our country where Rollier's sun-treatment could be used intelligently. But not having the benefit of such instititions at the present time we must face the situation as it lies before us today. Granted we have the advantages of hospitals specializing in heliotherapy there may always be cases which cannot spend a year and a half to three years in such institutions waiting for a definite cure. For these patients surgery may be preferable, as the ability to work with a painless limb outweighs for them the drawback resulting from an ankylosed joint.

THE POSTMATURE CHILD[1]

By CHARLES B. REED, M.D., F.A.C.S., Chicago

THE duration of human pregnancy is not accurately known and, on account of the obscurity that shrouds the meeting of the spermatozoon and the ovule it is questionable whether this problem can ever be exactly solved. Nor is it probable, furthermore, that methods can be devised which will enable us to discover the exact moment when the division of the nucleus begins after fertilization, nor under what combination of favorable circumstances the egg begins its excavation of the decidua.

We do know, through Bossi and others, that spermatozoa may remain active and fertile in the congenial environment of the female genitalia for periods varying from 17 to 21 days, but this information contributes more to our confusion than to our enlightenment.

Fertilization also may occur as well before the first period missed as after the last period present and in view of these various phenomena there is a color of justice in the claim of some of our colleagues that such a thing as a postmature child does not exist.

While doubt as to postmaturity in the child is occasionally met with, it is quite generally agreed among obstetricians but without conceding a relationship, that prolongation of pregnancy does occur, and it is the object of this paper to point out that prolongation of pregnancy is an important factor in postmaturity; that postmaturity is exactly as serious a complication as contracted pelvis and that a failure to recognize and correct the condition is an error in art associated with great danger to mother and child.

The duration of human pregnancy has been considered carefully by von Winckel and again reviewed in a logical and conclusive paper by McDonald some years ago, but it seems desirable to reiterate some of the principal premises of an argument to which nothing of importance has been added.

Through the examination of abundant statistics and the application of the law of averages a period for human pregnancy that is physiologically adequate has been fixed approximately between 270 and 280 days. Casalis gives 276 days counting from the menstrual periods and 270 counting from coitus. Issmer practically agrees with the last figures and assigns 268.2 days after coitus, but Reid's case of pregnancy that lasted 300 days after a single known coitus again disturbs our calculations

To allow for conceptions that occur before the first period missed, the upper limit of normal gestation has been set by several authorities at 302 days and this figure has been recognized as legal in some European countries. The marked diversity of opinion may be further illustrated by von Winckel's statement that the upper boundary should be set at 334 days after the last menstrual period and 321 after cohabitation. In his opinion the calculation from the menstrual period should be 10 or 12 days longer than that based on coitus.

Such differences among expert analysts not only emphasize our lack of knowledge but they stimulate us to find other standards than the history of the case which is obviously unreliable and frequently unobtainable.

If 274 days is to be regarded as the normal duration of human pregnancy, and this seems probable, then 334 or even 302 days cannot pass without extreme danger to the mother and to the steadily growing child.

When we go to the orchard or to the factory to note the progress of fruit or fabric we consider the factor of time as a variable incident merely and we look to the product itself to determine best its ripeness or its percentage of completion. In a similar manner it would appear rational to estimate the normal duration of pregnancy by the results achieved; to measure the advance toward maturity, not by the length of time passed in gestation, whether long or short, but rather, as McDonald suggests, by the state of development of the child.

Read before the Chicago Gynecological Society, January 16, 1920. (For discussion see p. 627)

The question of fœtal maturity requires a little illumination for, while "ripeness" *in utero* cannot be ascertained with scientific precision, yet it can be recognized within such safe and reasonable limits as to satisfy all the requirements. In fact it is easier to obtain the size of the child *in utero* than the size of the pelvic inlet, and it is more trustworthy to estimate the maturity of the fœtus than to calculate the termination of pregnancy by any history, howsoever reliable. Furthermore, the duration of pregnancy must always be an uncertain event since to the obscurity that surrounds the moment of conception must be added our ignorance of the phenomena which lead to the onset of labor.

The maturity of the fœtus is a definite landmark which, if recognized, indicates that the purpose of gestation has been fulfilled; that the normal end of pregnancy has been reached, and if labor does not soon occur both mother and child will be endangered.

We submit, therefore, that since the maturity of the fœtus is the only factor in the problem that furnishes objective evidence, it should, by this token, be given the first place in all computations of the day when labor properly should begin.

If the embryologists could tell us when the embryonic type of cell is transformed into the mature type, the time element in gestation would be more valuable, but Nature makes no sudden transitions and this highly significant event remains unreported. For our purpose, however, this transformation of the cells is not really essential since it could not be recognized clinically and we have other and more practical data nearer at hand.

The mature child must have organs that have attained such anatomical and physiological perfection that they will functionate satisfactorily when called upon by extra-uterine necessities. Such organs as the stomach, intestines, skin, lungs, and kidneys, relatively quiescent in the uterus, must be able to accept and sustain the larger responsibilities of atmospheric life.

In securing this development a variable period of time must be passed in the uterus and the completion of the process is associated with the attainment of a more or less definite fœtal length and a more or less definite fœtal weight.

"The chief phenomenon of intra-uterine life," says Ballentyne, "is growth, rapid and continuous in accordance with the plan laid down in the embryo. Within 7 calendar months, which is the duration, roughly speaking of human fœtal (not embryonic) life, the organism increases from a structure 1 inch in length and weighing 1 ounce, to a body 20 inches in length and weighing 7 to 8 pounds.

The tenth lunar month of intra-uterine life, or the eighth of truly fœtal life, culminates in the attainment of maturity or the "ripeness" of the fœtus. The end of profitable intra-uterine life has been reached. In these last four weeks there is still considerable growth both in length and weight though placental activity is practically at an end.

"The length of the fœtus reaches 51 centimeters and the weight 7½ pounds, more or less. The fœtus now (at the tenth lunar month with this weight and length) has the general appearance of maturity" which is so difficult to describe but is so quickly recognized by the expert. The mature fœtus is now ready for and capable of surviving its transfer into extra-uterine life.

With such data as a base we may tentatively permit ourselves to accept Ballentyne's definition of maturity as that state or degree of fœtal development whereby the child is enabled easily to surmount the perils and aggressions of extra-uterine life.

It is now proper and desirable for labor to begin but it does not always do so. In 6 to 8 per cent of the cases (Parvin), the child remains in the uterus and continues to grow while the attendant waits for Nature to complete her uncertain and fortuitous process. He temporizes.

Having spoken so disparagingly of the long-honored time element what can we say regarding the length, weight, and other phenomena, the clinical value of which, we believe, entitles them to more respect. Ballentyne has been quoted above as fixing the length of the mature child at 51 centimeters and in this estimate he is supported by Hirst and von Hecker. Webster, Dorland, Cragin, Eden, and

Edgar agree on 50 centimeters, while Peterson, Ahlfeld, Stumpf, Williams, and Issmer are content with anything between 50 and 51 centimeters. In our own relatively small series the length varied from 48 to 53 centimeters with an average of 50.2 centimeters. All the babes were mature as we understand the term. Obstetricians are apparently harmonious in the opinion that a babe of 50 to 51 centimeters is mature, although it is a matter of everyday experience that newborn infants differ from each other in length and more especially in weight even when there is reason to believe they have passed about the same period of time in the uterus. To allow for these variations in length some authorities extend the upper and lower limits. Hirst will go as high as 53 centimeters, Ahlfeld concedes from 48 to 56 centimeters, von Hecker and Issmer from 48 to 58 centimeters, and Goenner from 48 to 54 centimeters. It is our opinion that the upper limit cannot exceed 53 centimeters ordinarily, without entering the postmature class, while babes under 48 centimeters are rarely mature except in the case of twins.

It will be noted that the length of the babe does not show such wide differences as the weight. Mature length being once attained it does not respond so readily to the nutritional impulse. Further growth in length may take place but it is difficult and increasingly resisted. It is on account of this definite stability that the length necessarily becomes more reliable as a standard of maturity. The rate of growth in the last month varies from one to one and one-half centimeters a week according to Ballentyne, while our own measurements would indicate that ½ centimeter a week was a little short of the average.

The weight of a mature child has been considered from many sides and by many writers but the results agree more closely than one would expect. Thus Hirst and Dorland set the average at about 2,800 grams (6 pounds 1½ ounces). Edgar, Webster, Eden, Goenner, Cragin, Jewett, Stumpf, Williams, Ahlfeld, and McDonald accept from 3,200 grams to 3,300 grams (7 to 7½ pounds). It is not unreasonable, therefore, to put the average weight of the mature fœtus at from 6 pounds to 7¼ pounds (2,800 grams to 3,300 grams). However, American babes may weigh so little as 5½ pounds (2,500 grams) or so much as 9 pounds (4,000 grams), and still be within the limits of maturity.

The factors of fœtal nutrition are so numerous and their relations so intricate that it is impossible at present to obtain the co-efficient. It follows that all the elements of fœtal growth and especially those that are instrumental in the production of a large, not to say postmature child, are not demonstrable. Many explanations have been offered to account for that continuance of development which assuredly occurs so long as the child remains in the uterus. Among these influences may be mentioned the age or the size of the parents, the parity of the mother, whether she is married or single, the duration of the menstrual flow or the commencement of her reproductive life, her general health, social state and food supply or her conditions of rest or activity during gestation, the sex of the fœtus, and paternal inheritance. One or all of these conditions may or may not be potentially present. It is evident, however, that as the child reaches maturity *in utero*, organ formation practically ceases and only minor changes in shape and visceral relationship occur after birth. The purpose of the pregnancy is now fulfilled, and if labor does not soon occur one of two things must happen; either the babe dies *in utero* and undergoes the usual postmortem changes, or the nutritional impulse is extended and the child puts on weight. The additional weight consists almost wholly of fat and water.

By reason directly of the prolongation of the pregnancy, the child now becomes postmature according to the terms of our definition of maturity. Weight and length increase but especially the weight. As we have stated elsewhere, the deposit of fat in the babe, as in the adult, demonstrates that the intake of nourishment is not fully consumed because the normal limits of metabolism have been overstepped and in consequence the unusable material must be stored up. The child, normal in size and organically perfect, is forced to an abnormal growth through the unaccountable delay in uterine activity.

The point where this postmaturity usually begins may be set arbitrarily at 4,000 grams or 9 pounds, but there are exceptions. We must not forget that some babies which have passed more than the average gestational period in the uterus are lighter in weight than others that have not yet approached that movable boundary. Blau and Cristofoletti found 15.5 per cent of babes weighing from 6 to 9 pounds among pregnancies that lasted more than 300 days.

Nevertheless large fat babies are usually associated with prolongation of pregnancy and von Winckel claims that 71.8 per cent of all babes weighing more than 8½ pounds (3,600 grams) are postmature.

Many reasons have been assigned for the postponement of labor, but none of these can be satisfactory until the etiological factors in the inauguration of uterine activity at a given time have been explained.

Our own cases of large fat babies have been practically always associated with large placentas that weighed from 1¼ pounds to 2 pounds and we have come to regard this condition as customary. Whether the large placenta plays an important part in delaying the onset of labor we do not undertake to say but certainly it is physiological that a large placenta should be indispensable to the proper nutrition of a large child.

The child that has become overlarge through the prolongation of pregnancy shows an abnormal increase in the deposition of fat, as we have stated earlier, and exhibits tissues that are swollen by the infiltration of fluid. Ballentyne states that the proportion of fluid may be as much as 74.4 per cent of the entire body weight, and that a large amount of fat is deposited under the skin during the ninth and tenth months which at term amounts to 9.1 per cent of the body weight.

A certain amount of this fat and fluid is necessary for the support and sustenance of the babe during the milkless interval before the breasts fill, but an excess of such material is not only unnecessary but it is objectionable as a hindrance to organic function.

Fortunately both the fat and the fluid are quickly squeezed out of the child after birth. The heavier the babe, the greater and the more rapid the loss. In our series the babes that averaged 7 pounds lost 8.5 ounces in two and one-half days and then gained, while babes that averaged 9 to 10 pounds lost 14½ ounces in 3 days and then gained.

Obviously there is no particular advantage in the large fat babies about which we hear so much, since the tissue is so soon lost. Its presence is merely an indication that the end of profitable intra-uterine life has been passed over and that the postmature child has really spent time in the uterus which should have been spent in becoming accustomed to its new atmospheric environment.

The size of the fœtal head is the third objective point on which our diagnostic tripod must rest.

Von Winckel gives the average occipitofrontal diameter in the mature fœtus as 12 centimeters and the biparietal as 9.25 centimeters. Hirst gives practically the same figures. In our own series we found the occipitofrontal diameter of mature babes to measure from 10 to 12 centimeters and the biparietal to vary from 8.5 to 10 centimeters. The other diameters would be highly important but we cannot get them on the unborn child. Mature babies may exhibit diameters both larger or smaller than von Winckel's figures, but the postmature child will show a positive increase in all the diameters without disturbance of their proportion to each other.

To recapitulate it would appear—

1. That the actual duration of pregnancy has not been established and while the period has been closely estimated, it can never be more than an approximation.

2. That gestation is frequently abbreviated or prolonged unaccountably.

3. That the prolongation of pregnancy is a definite factor in the production of the postmature child.

4. That postmature babes are usually, though not necessarily, large and fat and weigh 4,000 grams or more.

5. That probably 6 to 8 per cent of pregnancies are for some reason prolonged (Parvin) and that 71.8 per cent of all babies weighing over 4,000 grams are postmature (von Winckel).

6. That a possible etiological factor may be found in the large and functionally strong placentas that are usually associated with large babies.

7. That large babies lose much weight rapidly and, therefore, possess no advantage over smaller ones.

8. That fœtal maturity is safer and more certain than the menstrual history, the date of a known coitus, or the date of quickening, as a basis for the calculation of the proper end of gestation.

9. That fœtal maturity, although fundamentally bound up with organic perfection, is really associated with reasonably stable objective characteristics of which the most important are the length, the weight, and the *fœtal head diameters*.

DANGERS

For the sake of completeness we must next refer briefly to the dangers, familiar to all of you, which hover about the birth of a large or postmature child. As soon as the weight of the child passes 4,000 grams, the difficulties in labor tend to become serious. The duration of the process, its termination, and its prognosis are definitely influenced. In reality it is not so much the weight of the babe as its volume; a bulkiness that may be due to fatness or huge shoulders, but there is especially a lack in conformability of the head that complicates the delivery. As a rule, however, it will be observed that the dimensions of the head increase in direct proportion to the weight. Furthermore, the bones of the head are dense and unyielding. They do not mold. The flesh is firm and inelastic, and the child advances only at the expense of an enormous overdistention of the parturient passage.

On account of overdistention of the uterus, the membranes rupture early and the large head does not easily engage. A long, slow, exhausting labor ensues which predisposes to infection of the mother through diminished immunity and the decomposition of the secretions of the birth canal.

On the other hand, if the pains are violent, rupture of the pelvic joints or rupture of the uterus may occur while lacerations of cervix, vagina, and perineum are more frequent than usual. Fistulæ into the vagina from bladder or rectum will follow the long continued pressure on the tissues.

Maternal fatalities may develop in the course of injudicious efforts to aid the delivery by version or high forceps while postpartum hæmorrhage must be expected in consequence of the overdistention which predisposes to weak contractions, imperfect placental separation, and poor uterine retraction.

The postmature child may perish before labor comes on, and during labor it is threatened with intra-uterine death through shrinkage of the blood supply, by strangulation at the vulva, by the pressure of a tightly retracted perineum and by cerebral compression, as well as by operative injuries. Asphyxiation, intracranial hæmorrhage, fractures of the skull, spoon-shaped depressions, hæmatoma, paralysis of face or shoulder may occur while the possible termination of the labor by craniotomy, cleidotomy, or evisceration completes the picture.

We say that a postmature child is exposed to the above injuries, but the question naturally arises, if we do not know the duration of pregnancy, how can we assert that it is prolonged and, if we do not know what constitutes maturity, how can we claim that a child is postmature?

When after repeated examinations the obstetrician is assured that the child is sufficiently mature according to our definition to carry on extra-uterine life easily then there is no need for the pregnancy to be prolonged further. This condition of the fœtus may readily eventuate 2 weeks before term, or exactly at the fortieth week, or again if the child be small it may be advantageous for the pregnancy to continue beyond the fortieth week, if possible. The condition of the child is determined by the—

DIAGNOSIS

The most conspicuous features of maturity must be sought, as we have stated, in the perfection of the various organs and in the length and weight of the fœtus and diameters of the fœtal head. The length and weight of

the babe and *some* of the diameters of the head are the only characteristics which can be determined by external measurement, and therefore the ones upon which a diagnosis of maturity *in utero* can rest. Fortunately they are sufficient.

Length. The length of the child can be obtained by means of the familiar method of Ahlfeld. In our series the antepartum measurements tallied exactly with the postpartum findings in 37 per cent, varied 0.5 centimeters or less in 24 per cent, and less than 1.5 centimeters in 29 per cent. None of these differences is great enough to interfere seriously with the diagnosis. We regard it as a procedure of extreme diagnostic value. Its simplicity is also a recommendation. One tip of the pelvimeter is placed under the upper fold of the genital crease and pushed upward until it rests on the upper edge of the symphysis. The other tip is placed on the most distant point of the opposite pole of the child (head or breech) which has been located previously. From the scale reading deduct 2 centimeters to allow for the thickness of the abdominal walls and multiply the result by 2. The product is the length of the child.

Size. The size of the child is merely another name for the weight. This information is obtained by means of McDonald's manœuver, which measures the height of the fundus. Varnier, Spiegelberg, and others from observations on large masses of material have stated that the fundus uteri should be 33 centimeters above the symphysis when it contains a mature child at term.

McDonald takes 35 centimeters as the standard and predicates that this height is attained when the uterus holds a mature babe of 3,300 grams (7⅓ pounds). The weight of the child is increased or diminished by 200 grams for each variation of 1 centimeter in the height of the fundus. We have not been disappointed in the use of this procedure, so far as concerns maturity. The weights, however, do not always conform to the antepartum estimates.

The *diameters of the fœtal head* are last in order though not in importance. These measurements are obtained by Perret's method which takes the occipitofrontal diameter directly and derives the biparietal from it by deductions which have been worked out on a scale of variables.

Perret planned at first to measure the occipitofrontal diameter as it lies across the pelvic inlet and then deduct 2.5 centimeters to get the biparietal. The results were not as reliable as could be wished. Next, Stone advised the omission of an allowance for the thickness of the abdominal walls. McDonald recognized that the biparietal must vary as the occipitofrontal varies, and devised a scale of deductions which, with a trifling addition, we have employed in our series. The scale follows:

To obtain the biparietal diameter from the

	Centimeters	Centimeters
Occipitofrontal of	12	deduct 2.5
Occipitofrontal of	11.5	deduct 2.25
Occipitofrontal of	11.25	deduct 2.0
Occipitofrontal of	10.5 to 11	deduct 1.5

The occipitofrontal poles are engaged between the tips of the fingers by deep pressure into the inlet on both sides of the pelvis. An assistant then measures the distance between the ends of the finger tips with the pelvimeter. The result is compared with the scale, and the deduction being made the biparietal is found.

In our series the measurement of the occipitofrontal diameter antepartum tallied exactly with the postpartum control in 40 per cent. It was within 0.25 centimeter in 34 per cent; within 0.5 centimeter in 24 per cent; and varied by 1.0 centimeter in 2 per cent.

The biparietal obtained from the above measurements was exactly the same as the postpartum findings in 36 per cent, within 0.25 centimeter in 31.7 per cent, 25.8 per cent were within 0.5 centimeter and the remaining five within 1.0 centimeter. McDonald's results were even better.

It should not cause discouragement if, in some cases, the relationship of the biparietal and the occipitofrontal should not conform postpartum to the antepartum estimate, for it has been shown that while these proportions are stable in normal cases and in those de-

livered by cæsarean section, there is a marked discrepancy where the head has passed with slowness and difficulty through the birth canal. In all the cases where the head was molded, Ballentyne found a diminution in the occipitofrontal, occipitomental, and sub-occipitobregmatic diameters. In heads that pass the pelvis without forced conformation the interrelations of the diameters are not affected.

In our work at Wesley Memorial Hospital, we rely almost entirely on the results of the above three procedures, corrected and checked, of course, wherever possible by the menstrual history and the date of quickening. In hospital practice, however, the menstrual history and date of quickening are unreliable even when known, and we have come to give them a place of very minor importance.

Our experience with the methods described has been gratifying, and we feel confident that they will enable the attendant to recognize most cases of mature babes as we have defined and described them and all cases of postmaturity. Abdominal walls that are unusually fat or muscular, or distended by hydramnios may cause confusion, but these conditions are rare. Twins may complicate or delay the diagnosis, but the patient is not imperiled. Furthermore, the examinations are all external and the danger of infection is not to be feared.

In our experience, the estimation of fœtal size and head diameters is far more reliable than the appreciation of the pelvic diameters by the customary procedures.

TREATMENT

When diagnosis of maturity or postmaturity has been made what shall we do? It is too late to influence the size of the child by Prochownick's diet except in those rare cases of habitual postmaturity described by Moisnard. Here perhaps the conditions could be anticipated.

The principle of management must be based on the results of regular and painstaking examinations of the child with a merely subsidiary interest in the subjective history.

If the child is mature and the pelvis not seriously contracted, several days or a week may be permitted to elapse, and then if Nature fails in her duty, a day should be set and the labor induced.

The induction may be brought about easily, safely, and expeditiously by castor oil and quinine, or by the Voorhees bag, or by both. Castor oil and quinine is effective in possibly 2 cases out of 5 but the Voorhees bag is always highly dependable.

If the attendant has not been watchful or if through the weight of tradition he has allowed the child to become postmature, a careful revision of the pelvic diameters must be undertaken. This examination may show that the transit of the child through the maternal passages would be highly questionable and possibly accompanied by more than ordinary danger. In such a case the cæsarean operation will suggest itself as the most conservative way of terminating the pregnancy.

On the other hand if the delivery by the pelvic route seems feasible, even though difficult, labor may be induced by the bag with a reservation that if the natural powers are insufficient, delivery may be completed by version and extraction or forceps, depending on the conditions and preceded if necessary by pubiotomy.

To foresee difficulties that impend and to anticipate them by proper and judicious means is called by rhetoricians a "prolepsis." To foresee the obstacles and dangers which attend and follow the birth of a large or postmature child and to avert them by intelligence and skill is good obstetrics. Unhappily or otherwise we all have an ingrained reluctance to intervene in the course of what is apparently a regularly advancing pregnancy. It is much easier to let the business slip along under the impression, born of our hopes rather than of our knowledge, that by watchful waiting the problem may solve itself. Being loth to act we temporize.

"Watchful waiting," has been a popular phrase which was first used, as we recall, by Dr. Jaggard of Chicago, to discourage the attendant in those days of imperfect asepsis from unwarrantably interfering with the course of a pregnancy or labor. It was a valuable precept in its day, and doubtless

saved many lives. But the tendency of the maxim has been to excuse the timid and exonerate the indolent. The possible breadth of its application involves a larger element of danger than the condition it was designed primarily to avert. It certainly favors the occurrence of the postmature child.

We believe that more attention should be paid to the objective evidence furnished by the child *in utero*, and if this were done and generally taught the postmature child would appear less frequently and the large child would lose much of its present questionable distinction. Every case of pregnancy should be individualized without dependence upon hazy half truths or the laws of probability. Let the child affirm and the pelvis declare the anatomical gospel.

This is an epoch of clean surgery wherein *laissez faire* methods are justly looked upon with alert discrimination. Let us give to pregnancy and labor, therefore, their full significance and let us bring to the mother and child all the advantages and the fullest protection of a clean and prudent prolepsis.

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SHORT UMBILICAL CORD[1]

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THIRTY-TWO years ago, in January, 1887, John Bartlett presented to this Society a paper on dystocia caused by malposition of the cord, reporting a case where the cord was coiled four times around the neck of the child. This was discussed by Jaggard, Knox, Miller, and others. In 1902, as many of you will remember, Stowe presented a paper on rupture of the umbilical cord relating two cases, discussing the subject of short cord and giving the results of his valuable experiments in determining the tensile strength and elasticity of the funiculus. Tonight I wish to report a case that is a fairly typical example of an accidental short cord.

Mrs. H. L., I-para, age 27, Russian Jewess, married. The patient had a deep scar on the thigh due to a sword cut received during a pogrom when a child of 5. Her menstruation began at 14, and was of the 28–3-day type, moderate in amount and associated with some pain. Her last menstruation was on February 3, 1919, conforming to labor November 10. Pregnancy was normal. Her external pelvic measurements were: interspinal 25.2, intercristal 27.8, Baudeloque 20. The conjugate diameter was normal. Labor began November 16, 1919, at 7 p.m., with irregular moderate pains lasting to 40 seconds. External examination disclosed the head in the inlet, position back, right, posterior; heart tones 130 in right lower quadrant. The first internal examination was made at 8.10 a.m., November 17, and showed the os dilated 1 finger and membranes intact with head *in aditu*. The contractions were fairly good during the day and not very painful. No region of the uterus was especially tender and there was no sign of depression of the fundus or of any other area. A second internal examination at 4.20 p.m. showed the cervix was effaced and thin with the os 1½ fingers dilated. On the 18th, the contractions continued to be moderate in strength, lasting about 45 seconds and coming about every 5 to 7 minutes. The membranes ruptured about 1 p.m., a small amount of liquor amnii escaping. An internal examination showed the cervix soft with the os dilated about 3 fingers. The head was still *in aditu* and the position was right, back, anterior. Another internal examination, the fourth, at 4.20 p.m.. showed no change. The fœtal heart tones ranged between 134 to 146. The patient received during the day in all 5/16 of a grain of morphine sulphate, which was enough to relieve her pain. On the next day I examined her for the first time in the clinic and found the cervix one-third dilated with a thick rim. The head was in the excavation. The fœtus was in good condition and the heart tones about 140 per minute. As the mother was in good condition with normal temperature and pulse and as the slow labor was attributed to slow dilatation of the cervix, it was decided after considering the objections to interference to allow the labor to continue, of course, watching the mother and fœtus very carefully. The fœtal heart tones were counted and recorded every 15 minutes. During this day 5/16 of a grain of morphine sulphate and 1/100 of a grain of scopolamine were given and kept the patient fairly quiet. On the following day, November 20, at noon I found the patient beginning to show signs of exhaustion with some increase in the pulse but no increase in temperature. For the first time there was a slight show of meconium and the fœtal heart tones were somewhat irregular, between 146 and 160. An internal examination showed no change since the examination 24 hours before. The patient was anæsthetized with ether, a deep incision made anteriorly and posteriorly in the cervix and forceps applied. As the head was brought to the perineum an episiotomy was made and the head extracted. During the extraction the cord, which was coiled twice around the neck broke about 10 centimeters from the umbilicus. The entire length of the cord was afterward found to be 43 centimeters. The child which weighed 7 pounds 2½ ounces was somewhat asphyxiated and resuscitated in the usual manner. A considerable quantity of discolored fruit water followed the child. The placenta was expressed from the lower segment and the cervical and vulvar incisions were repaired. The membranes were torn near the center showing a high implantation of the placenta which, from the previously observed direction of the round ligaments, was probably attached to the left anteriorly. The cord which was of average thickness was attached not very far from the center of the placenta. It may be added that the mother, the day after the labor, had a temperature of 101° which then became and remained normal. The milk secretion was slow in appearing and the baby as the result of deficient nourishment lost about ¾ of a pound in weight, but later gained and left the hospital with the mother on the twelfth day weighing about 2 ounces less than at birth.

After birth, measuring with a tape line, the distance from the navel of the child twice around its neck to the clavicle was 56 centimeters. As the cord measured only 43 centimeters in length and

[1] Read before the Chicago Gynecological Society, January 16, 1920 For discussion see p. 629)

had to reach to the placenta it is evident that the umbilicus must have approximated closely to the neck of the child and the cord stretched considerably. It is also evident that the chest of the fœtus must have been held close to the insertion of the cord in the placenta. Considering the nearly central rupture of the membrane and also the fact that the cord was inserted quite a distance from the edge of the placenta, the insertion of the cord must have corresponded to a point in the uterine wall more than 15 centimeters above the internal os or considerably more than the vertical diameter of the head. Consequently the head could not have exerted much pressure on the cervix nor could it serve well in the mechanism of the dilatation of the lower uterine segment. This might account in part for the very slow progress after the rupture of the membranes.

Could the holding back of the head account for the slow dilatation before the rupture which did not occur until 42 hours after the beginning of labor? While there was less than the average amount of liquor amnii, nevertheless a fair bag of waters was formed. The dilatation of the cervix depends upon the nature of its anatomical structure by virtue of which some of its fibers are pulled up into the corporal wall. There is much variation in the dilatability of cervices. In apparently normal paræ with unruptured membranes and normal fœtus and with fair uterine contractions we not very infrequently have an opening period of 40 or 50 or 60 hours. I am in the habit of explaining this fact by assuming a poor dilatability of the cervix. It seems to me that we may in this case also assume such a structural anomaly to account for the slow progress before the rupture of the bag of waters.

There was no obstruction in the bony pelvis that prevented descent. As recorded, the head, with the uterus of course, descended into the excavation in the last 36 hours of labor.

Our chief interest is naturally in the problem of diagnosis as determined by the symptoms and findings. My experience in diagnosing an absolutely or relatively short cord has not been encouraging. I have had two cases of absolute short cord, one terminated with forceps, when cutting of the cord seemed desirable to permit the birth of the body. I have had a few cases where the cord which was coiled around the neck of the child had to be cut to allow birth of the body. In none of these cases was the diagnosis made before the birth of the head.

In this case the usual symptoms were absent or not prominent. There was no special tenderness in any region of the uterus and no retraction of any part of the uterine wall during contractions. There was no hæmorrhage due to partial separation of the placenta. As the head had not escaped from the uterus there was no recession of the head from the vulvar outlet. No funic souffle was heard, although perhaps 100 examinations were made during the labor to control the condition of the fœtus. It must be admitted, however, that no attempt was made to listen during contractions and hence the intermittent souffle mentioned by Halzbach as found during contractions and due to tension on the cord may have existed. As the head was still in the uterus the condition was probably not present for the intermittent urination described by Brickner. At any rate this symptom was not observed. There were in short no symptoms of short cord except very slow dilatation of cervix and prolonged labor.

The suggestion of Haake did not occur to me; to examine through the rectum for the coils around the neck of the child. This would not have been possible, of course, during the first 3 days of the labor before descent.

In regard to treatment I only wish to remind you of the recommendation of King that advantage be taken of posture in the management of these cases. His special attention to this subject and his enthusiastic advocacy of postural treatment makes its trial desirable. Of the various reasons given to explain the advantage of a sitting or squatting posture the most probable seems to be that it favors descent of the uterus and so brings the point of the insertion of the cord nearer the outlet of the pelvis. This posture might likewise have favored dilatation in my case. The obstetrical chair lately reintroduced into our armamentarium by Markoe might serve our need here. The simplest method would be to let the patient sit up or kneel or squat in bed.

If after the birth of the head the expulsion of the body is rendered impossible on account of relative shortening of the cord by coiling around the neck, it is only necessary to clamp and cut the cord. Any attempt to release a coil and pull it over the head may prove harmful or dangerous by separating the placenta. This is one of the important reasons for the adoption of Schultze's rule to make no attempt to release funicular coils during labor.

TYPES OF PELVIC INFECTION[1]

By THEODORE J. DOEDERLEIN, M.D., Chicago

THERE are few subjects in gynecology written about and discussed as much as pelvic infection in the female, and I bespeak your forbearance for introducing this trite and time-worn topic for your consideration. However trite it may be, there probably is no other preventable disease as much sinned against as this one. Ninety per cent of all cases of female invalidism and morbidity, not speaking of the fatal cases of puerperal sepsis, are due to preventable causes. Dr. Davis, in a paper recently read before this society, pointed out that in the last decades there is little, if any, decrease in the death rate of childbed fever. Brock, in the August number of the *Lancet* writes: "To gauge results by hard figures is to admit the comparatively small reduction in mortality rate of puerperal sepsis." V. Bonney in the *Medical Press*, 1919, says: "The chief causes directly and indirectly attaching to pregnancy and labor rank in importance as follows: (1) sepsis, (2) pregnancy toxæmia, (3) hæmorrhage, (4) embolism and sudden death. Sepsis accounts for between 30 to 35 per cent of the total number of deaths." The chief medical examiner of one of our large life insurance companies upon my inquiry wrote to me that he was inclined to believe that deaths from puerperal sepsis were decreasing. He admitted, however, that statistics from insurance reports were unreliable, because pneumonia and other intercurrent diseases were listed as "childbed."

All these statements comprise the fatal cases of puerperal sepsis only. The vast number of cases of parimetritis and perimetritis, salpyngitis, oophoritis, productive of chronic invalidism and morbidity come to our notice in their severest phases only. Many of the milder cases undoubtedly drag through life unobserved and unrelieved.

In the young the vagina is sterile. Contamination may occur through baths and oilings. These bacteria, including the staphylococcus pyogenes albus, aureus and citreus, are usually entirely innocuous. It is generally known, that bacteria lose their virulence and are not as numerous the nearer one approaches the cervix. Recently I have taken cultures from various parts of the vagina of specifically infected women. As the disease abated the gonococcus disappeared first at cervix and was to be found at the introitus long after the vagina had been found free. The reason for this seems obvious. As the tissues regain their health, the normal flora, especially the bacillus vaginalis, resumes its activity, resulting in the destruction of the virulent bacteria experimentally introduced. It is assumed that the accidifying action of the bacteria has this germicidal effect. Menge differs from this view. Whatever it may be, we know that anything removing or interfering with the natural flora of the vagina, as frequent douches, strong antiseptics, the alkaline leucorrhœal discharge, cervical erosions, the menstrual epoch, predispose to pelvic infection. Strogonoff found that there is an increase of abnormal micro-organisms in the vagina preceding and following menstruation.

Generally speaking one may say that in cases of pelvic infection, bacteriology is of little value as to the course of treatment to be pursued. A streptococcus may be highly or mildly pathogenic. Hæmolysis is not an inherent attribute of any streptococcus, but it is acquired and may in turn be lost. Saprophytes, including the bacillus coli may attain fatal virulence. There also may be an important factor lying in the anaphylaxis of certain patients toward infection.

For convenience the whole subject of pelvic infections may be classified into two types; the ascending, or infection through natural channels, and the decending, or blood stream and contiguity infections.

The vast majority of infections is of the ascending type and of these we again have two types of overwhelmingly frequent occurrence; namely, the puerperal and the gonorrhœal.

[1] Read before the Chicago Gynecological Society, January 16, 1919. (For discussion see p. 628.)

Puerperal infections are wound infections. The wound may be a small tear in perineum or cervix, any abrasion in the vagina, the large wound of the placental site, a wound caused by a curette, sound or finger-nail, or any other instrument including a penholder or hairpin. In 90 per cent, the infection is introduced by the surgeon's or midwife's fingers or instruments. As Trousseau first points out, the infection enters the parametrium by way of the lymphatics and veins causing thrombophlebitis and adenitis; also infiltration of the cellular tissue surrounding the cervix inside of the broad ligaments, causing what Virchow first called parametritis, a distinctly extraperitoneal or retroperitoneal disease. Rarely this type of infection extends along the mucosa into the tubes. Usually tubal infection takes place indirectly through parametrial lymphatics.

Of considerable interest in this connection are the painstaking studies of Moritz, published in the *Journal of Obstetrics and Gynecology of the British Empire*, in 1914. He shows that the subperitoneal cavity and the base of the broad ligaments, filled up in the fœtal state by a cellular matrix of undifferentiated mesoblasts, loses its fat and becomes a dense fibromuscular tissue with fixed and definite directions along the branches of the uterine arteries for which they form a dense perivascular sheath. This tissue, known as the parametrium, consists of superimposed layers of unstriped muscular bands running into the uterus and outward, forming sheaths for the obturator internus and coccygeus muscles. The parametrial tissue is densest opposite the lower segment of the uterus and the entrance of the vascular supply of this organ. So this part, as it were, is the pedicle of the uterus. Bearing in mind this anatomical condition, we better understand the brawny inflammation around the cervix, the phlegmon ligneux, a wood-like induration around the cervix.

A case I saw with a younger colleague illustrates this type of inflammation as also the treatment to be avoided. Four weeks after an abortion she had a temperature ranging between 100 and 102°, a mucopurulent discharge, and board-like infiltration surrounding the cervix. I urgently advised against operation which was seemingly attractive to the husband and attending physician. Two weeks later I was asked to see the same patient in a hospital. She had been operated upon by her physician, the tubes and ovaries had been removed, and the patient was now in a fearfully septic condition. She survived, but her recovery was much more protracted than it would have been in all probability, without operation. With an understanding of the parametrial anatomy and the avenues and localization of the infection, it is readily seen the immense traumatism the above stated operation inflicted. This case should not have been operated upon until all acute symptoms had subsided at least 3 to 4 weeks and then, in my opinion, not without some definite indication.

Simpson tabulates the time for operation in such cases as follows: (1) The patient shall have recovered from her acute illness and shall have regained a satisfactory margin of reserve strength. (2) The temperature shall not have risen above normal for at least 3 weeks. (3) There shall have been no marked or persistent rise of temperature following a careful bimanual examination. (4) The inflammatory exudate surrounding the focus of infection shall have been completely absorbed.

In the above stated case nature's effort to localize the infection by choking the afferent lymphatics was frustrated very effectually by the treatment.

There is the other extreme of allowing too much time to elapse before such foci containing virulent bacteria, usually streptococci, are removed. Complete organization between cyst walls of ovaries, pelvic peritoneum, and contiguous organs will have taken place, necessitating extensive wounding of tissues, removal of diseased organs, and separating of adhesions. To illustrate this I wish to cite two very instructive fatal cases.

A patient, afflicted with the ordinary symptoms of female trouble, came for operation. She had had a puerperal infection 9 years previously. Her ovaries consisted of large cysts firmly bound down and matted together with intestines, omentum, and tubes. Owing to complete organizations of the adhesions it was very difficult to separate the organs. The cysts broke before removal. Although more than

ordinary care was exercised to wall-off the peritoneal cavity and establish ample drainage, the patient had a temperature of a 105° on the second day and died of violent peritonitis the fifth day. The infection was purely streptococcal.

The other case had had a pelvic cellulitis of the phlegmon ligneux type for 6 weeks. She still had a temperature and wood-like induration around the cervix. Six weeks later. 12 weeks after infection, the temperature remained normal, the exudate had disappeared. and she was sent home with instructions to come back for examination a year later. She came and an operation was deemed necessary. The adhesions, were so extensive, that on opening the abdomen no female organs could be seen until actually dug out. One ovary and tube were left, because, if at all possible, the patient could have offspring. A Gilliam suspension was made. Without much peritoneal re-action the patient recovered, went home and, as if pre-arranged, conceived. Her labor was normal but was followed by a high temperature. I was called to examine the patient and found a large cyst on the side on which the ovary and tube had been left. The next day the attending physician notified me that the cyst had broken. The patient died of violent peritonitis.

These cases teach, first, that highly virulent bacteria may become encysted and, retaining their virulency, may remain dormant for many years; second, that late operations in cases of encysted streptococcic infections are more dangerous than a judiciously chosen earlier time; third, that in spite of the most intense puerperal infection, with roofed-over pelvis and general adhesions, the generative organs may remain undisturbed, unlike the condition found in gonorrhœal infection, gonorrhœa being a past master at destroying or, at least, incapacitating the organs.

The other ascending infection generally met with is gonorrhœa. Gonorrhœa of vulva and vagina is a menace to the community including the unborn child, the glands of Bartholin often hiding gonococci for months, even years. Gonorrhœa of tubes and ovaries is a menace to host, rarely as to life, but almost always as to her reproductive functions. A vaginitis of any severity is present only in the young. Endocervicitis, found in 90 per cent of cases, is started by endotoxines, producing ectropion and eventually a pseudo-adenomatous area with infected Nabothian follicles. Saenger would point out this folliculitis in young women as pathognomonic and apply 50 per cent solution of chloride of zinc.

There are two barriers to the ascent of gonorrhœa, namely the internal os and the ostium uterinum of the tube. The gonococcus has no motility, it spreads by surface growth or by deportation. Conditions favoring ascent are, first, menstruation; second labor; third coitus; fourth digital or instrumental examinations of vagina or uterus and meddlesome treatment with douches and instrumental applications.

Mild tubal infection may permit conception. It remains latent until labor ensues, when an awakening of the dormant foci causes complete sterility. We all have had cases of labor followed by salpyngitis or perimetritis, although no vaginal examination had been made. These are cases of latent tubal gonorrhœa. The possibility of a mixed infection, of course, exists.

Summing up and contrasting the two types of infection I would say the following: Puerperal infection is dangerous to life, both immediately and remotely. I appreciate that many streptococcic masses are found self-sterilized; usually, however, they are a menace to the life of the patient at all times during their presence in the pelvis. Gonorrhœal masses are always tubal. Gonorrhœa confines itself as a rule, to an organ which it seeks to destroy. Operations for gonorrhœal pelvic infections, even with a large amount of pus, are always safe, of course, relatively speaking; recovery is prompt and without peritoneal reaction, if one is able to remove pus pockets. Crossen, in his discussion of Simpson's paper quoted above, says that he depends on two things in his differential diagnosis; on location of lesion and history of case. Where location is tubal and the history points toward gonorrhœa the case may be operated upon any time after subsidence of acute symptoms. Where lesion is parametritic and history points to puerperal septic infection, abdominal operations are dangerous at any time.

The acute state of these infections, whether parametritis, caused by the streptococcus, staphylococcus or pneumococcus or the bacillus coli, or whether a salpyngitis or parametritis of gonorrhœal origin, I have treated for years simply with absolute rest in bed with

the patient lying on her back and being lifted with care onto the bed-pan, and with ice, opium, external douches, and wet packs as needed. No meddlesome treatment is given with the hope of killing germs. My first and only vaginal examination is careful and gentle, and even this may occasionally start trouble, giving rise to a return of chill followed by fever.

This negative treatment I employ not only in acute gonorrhœa or puerperal pelvic infection, but also in cases of septic abortion with retained placenta. My rule in the care of septic abortions might be formulated as follows: The course of treatment is the reverse of what ordinarily is accepted as proper, the more virulent the type of infection, the less aggressive and meddlesome the treatment; the milder the type of uterine infection, or in the entire absence of infection, the more one may be inclined to hasten matters by emptying the uterus. Some years ago Dr. Ries presented a paper on this subject. It was to the amazement of some of his hearers that he stated that he would leave a foul-smelling, pus-laden placenta undisturbed and get good results. Since then I have followed this line of treatment.

The other type of pelvic infection, however rare, still to be considered in differential diagnosis, is the descending type, which originates by blood stream or contiguity. This type of infection is best elucidated by a case I had occasion to observe through many years.

About 18 years ago I examined a girl of 8, who had a severe pain in the left groin, a tender resistance reaching about two fingers' breadth above Poupart's ligament, and a temperature of 102 to 103°. On rectal exploration a parametrial induration could be made out. The history of the case stated, that the little girl wetted herself at school and sat in her wet clothes all day. The fever, pain, tenderness, and mass disappeared in the course of a few weeks. A blood examination was not made. The patient through these years complained of occasional attacks of pain. About a half a year ago I again examined her *per rectum* and found evidences of an old parametritis with the uterus more or less fixed and drawn to left side. The parametritis obviously was a blood stream infection from bacillus coli.

Infections by contiguity are mostly due to appendicitis. This disease often produces the most extensive perimetritis with tubal and ovarian complications. We have all had cases of this type. However, it is often difficult to ascertain if the perityphlitic inflammation is primary or secondary. In the case of a patient of mine this difficulty was removed. She had appendicitis, then called inflammation of the bowels by the old family physician, at the age of 2. After marriage 22 years later, the old focus flared up, necessitating operation.

Findings were equal to those of the most intense *ascending* infection. The traumatism, however, caused little peritoneal reaction, in spite of complete organization of adhesions, demonstrating the comparative safety of operations after *descending* infection.

Chomè[1] describes a peculiar variety of ovarian infection, which I would classify as descending; a non-puerperal abscess of the ovary. It is an infection of the ruptured follicle of the ovary, forming an abscess of corpus luteum as indicated by the lining of the abscess cavity which consists of luteinic membrane—and by the intact state of the remainder of the ovary. It is especially in connection with adhesions of ovary to intestines that this abscess occurs.

The usual origin of tuberculosis of the pelvic peritoneum, tubes, and ovaries is by descending infection. Primary tuberculosis of the cervix is very rare. Moore[2] describes a case of primary tuberculosis of cervix. He attributes the origin to infection by the blood-stream, to descending extension from the tubes and ovaries, or to coitus with, *horribile dictu*, tubercular sputum as a lubricant. Carstens[3] warns against removal of tubercular tubes and ovaries in young women when operating for tubercular peritonitis, as tuberculosis of the peritoneum is a descending infection, i.e., of systemic origin, and, except in the rare instance stated, does not come from the outside through tubes.

[1] Arch. mens. d' obst. et de gynéc., Par., 1919.
[2] Surg., Gynec. & Obst., 1919, xxix, 1.
[3] J. Am. M. Ass., 1919.

SUMMARY

I wish to emphasize the following points:

1. The classification of pelvic infections into ascending and descending is not merely academic but of practical value for better analysis of the cases, especially with regard to prognosis.

2. Operations for *descending* pelvic infections are rarely connected with grave danger, once the infection has reached the quiescent or elective period.

3. One should seek to make a differential diagnosis in the *ascending* type, i.e., between puerperal and gonorrhœal infections, before operation, as the prognosis depends on proper diagnosis.

4. Judicious conservatism is productive of best results.

INTUSSUSCEPTION RESULTING FROM BENIGN TUMOR OF THE INTESTINE

Report of Three Cases[1]

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FROM the standpoint of the surgeon, it is usually held that benign tumors of the small intestine are comparatively unimportant. The basis for this view exists in the infrequency of the occurrence of such neoplasms and also in their non-malignant nature. How seldom benign tumors are encountered anywhere in the gastro-intestinal tract seems illustrated by the paper of King (11), appearing in 1917, in which it is stated that a careful search of the literature enabled the author to find the reports of only 118 cases of benign intestinal tumors where the diagnosis had been confirmed histologically. Among the reports collected by King were those of 17 adenomata, and, of this number, only 5 were located in the small intestine. It has been pointed out by Rhodenburg (15) that King was too conservative in the selection of cases for his summary, omitting reported instances of lipomata, myomata, and fibromata which had been confirmed histologically. The same criticism seems to be valid in regard to his selection of adenomata, as will be shown later. But, although wanting in strict accuracy, King's paper serves to show that the occurrence of such tumors is uncommon in the experience of surgeons.

Kasemeyer (9) has emphasized that these so-called benign tumors not infrequently may give rise to serious or even fatal disturbances. A profound degree of anæmia may result from the constant hæmorrhage following trauma to the new-growth, but of particular interest in this connection is the possibility of intussusception resulting from their presence.

During the past 10 years in my private work, it has been my fortune to encounter one case of fibroma and two cases of adenoma of the small intestine. These cases are interesting, not only because of their comparative rarity, but also because in all 3 patients a condition requiring prompt surgical intervention existed; namely, an intussusception. The report of cases is as follows:

Case 1. M. W., female, age 8., admitted to Johnston-Willis Sanatorium on September 9, 1919. The family history is negative. The patient has never been healthy, but has been weak and undernourished. For the past 2 years she has suffered with severe abdominal pain, regurgitation of food, and at times constipation. For 7½ hours before admission to the hospital she suffered with an attack of severe abdominal pain accompanied by nausea, vomiting, and constipation. On admission, she appeared sick and toxic, and had persistent vomiting. Physical examination showed a weak, emaciated child, apparently undernourished. She had tenderness over the abdomen, and a mass could be palpated in abdomen, approximately in the midline, just below the umbilicus, and about size of a lemon. A diagnosis of intussusception was made and operation advised.

The abdomen was opened through a right rectus incision, and an intusssusception of the ileum,

[1] Read before Southern Surgical Association, New Orleans. December 18, 1919.

which was impossible to reduce, was delivered. We resected 18 inches of the small bowel up to within 6 inches of the ileocæcal valve, removed the gangrenous bowel *en masse*, and did an end-to-end anastomosis. On opening the specimen a tumor was found at the apex of the intussusceptum. The patient died 14 hours later. No autopsy.

Pathological report. The tumor was globular in shape and measured about 2 centimeters in diameter. It was hard and smooth, and imbedded in the serous coat. Microscopic examination showed the tumor to be made up of a dense fibrous tissue. Diagnosis: fibroma.

CASE 2. W. B., male, age 16, admitted to Johnston-Willis Sanatorium, June 29, 1910. The family history was negative. The patient has always been healthy, except that for several years he has been subject to attacks of abdominal pain. A year before coming under our care, a diagnosis of appendicitis was made and the appendix removed; without, however, affording relief from the abdominal pain. A week before admission, the patient suffered from an attack of abdominal pain of unusual severity, accompanied by nausea and vomiting. On admission, he complained only of general abdominal tenderness. Physical examination revealed a strong, well-nourished boy, apparently in perfect physical condition; a three-inch scar over McBurney's point; slight abdominal distention and general tenderness on palpation.

It was deemed advisable to employ expectant treatment and keep the patient under observation, in the hope that another attack of pain might occur and a clue be obtained as to the cause. Ten days after admission, he was seized with severe abdominal cramps. Examination revealed a mass lying across the abdomen. A diagnosis of obstruction was made, and operation advised.

The abdomen was opened through a right rectus incision. As soon as the peritoneum was incised, a very much thickened and enlarged small bowel came into view. The mass which had been palpated previous to operation was delivered outside the wound and found to consist of an invagination of the ileum, at least 3 feet in length. The intussusception was easily reduced, revealing the presence of a tumor about the size of a pigeon's egg and occupying the apex of the intussusceptum. Below the tumor, the lumen of the intestine was greatly enlarged, the walls being much thickened and hypertrophied, giving an appearance such as is often seen in the intestine above a partial chronic obstruction. Since, however, in this case the hypertrophied gut lay below the tumor, its occurrence could only be explained by the repeated formation and reduction of an intussusception. The wall of the intestine was incised at the site of the tumor and an elliptical portion of the wall, bearing the attachment of the tumor, was excised. Microscopic diagnosis: adenoma.

Since we now had a widely dilated portion of intestine lying below a portion of normal size, the problem was presented: how to prevent the recurrence of the invagination. This was solved by reducing the caliber of the dilated gut through the introduction of several rows of sutures which caused a plication of the wall.

The patient reports that he was completely relieved from the abdominal symptoms and that he is in excellent health 9 years subsequent to the operation.

CASE 3. A. K., female, aged 7, admitted to Johnston-Willis Sanatorium on April 6, 1919. The family history is negative. One year prior to admission, the patient had an attack of abdominal pain of great severity, but recovered without being seen by any physician. Three weeks ago, a similar attack occurred, lasting several hours. Again, no physician was called. Three hours before admission, while playing in park, the patient was seized with agonizing abdominal pain, accompanied by nausea and vomiting. The pain was so severe that the child was completely prostrated. Physical examination showed a mass, several inches in diameter and about a foot in length, extended diagonally across the abdomen, just above the umbilicus. A diagnosis of intussusception was made.

Two hours after admission, the condition being unaltered, operation was advised. Through a midline incision, the mass was delivered and found to consist of an ileal intussusception, about 2 feet in length. The invagination was reduced with great difficulty and, as in the preceding cases, a small, pedunculated tumor was found at its apex. The serosa over the attachment of the tumor presented a puckered appearance, resembling that sometimes seen in the skin over early carcinoma of the breast. For this reason, it was deemed wise to resect about 6 inches of the small intestine, followed by end-to-end anastomosis. The child was reported fully recovered 8 months after operation.

Pathological report. The tumor measured 2 centimeters in length, 1 centimeter in thickness, and 1 centimeter in depth. It was soft, smooth, and pinkish-gray in color, and it was attached to a small portion of the bowel wall by a pedicle which measured one-half centimeter in length and one-half centimeter in thickness. On section it appeared to be lobulated and the lobules varied in size from a pinpoint to a pin-head. Microscopic section (transverse) showed the tumor to have a gland-like structure, not unlike that seen in a normal mucosa. The acini were lined by a columnar epithelium and goblet cells. Some of the acini were cystic and contained mucus. There was a connective-tissue stroma between the gland-like collections of epithelium. Near the pedicle and in the region of its attachment to the bowel wall the acini suggested a malignant degeneration, but there was no apparent invasion of the bowel wall. Diagnosis: adenoma.

All of my cases were in children from 7 to 16 years of age. Symptoms of recurring attacks of abdominal pain, extending over a

period of 1 to 5 years, occurred in all. The tumor was in the ileum in every instance. It was necessary to resect the bowel in two cases of acute intussusception. In one case, a chronic reducible type, plication of the bowel was all that was necessary. Two recovered, one died. Microscopic examination showed one to be a fibroma and two to be adenomata.

Summaries of the reported cases of fibromata of the intestine have been made by King (11) and also by James and Sappington (8), the latter authors being able in 1917 to collect from the literature the reports of 25 cases of intestinal fibroma. Rhodenburg (15), in April, 1919, reported two more cases and another has been reported by Henrichsen. I have been particularly interested, however, in the adenomata and shall confine myself chiefly to a discussion of this type of tumor.

As has already been mentioned, King, in 1917, was able to find recorded in the literature the reports of only five adenomata of the small intestine, and in only two of these cases was the tumor accompanied by intussusception. On the other hand, Kasemeyer, 5 years before the appearance of King's paper, collected the reports of 10 cases of adenoma of the small intestine complicated by intestinal invagination.

In addition, I have been able to find the following cases of adenoma associated with intussusception reported, which, though the diagnosis was confirmed by miscroscopic examination, were omitted from Kasemeyer's and from King's summaries:

Scudder (16): Young male adult. Adenoma of ileum accompanied by intussusception and volvulus. Operation. Recovery.

Watts (18): Male, age 24. Multiple adenomata; recurring intussusception. Operation. Recovery.

Brataud (1): Female, age 16. Multiple adenomata; recurring intussusception. Operation. Recovery.

One paper, containing report of two cases by Hartmann (6).

Since the appearance of King's paper, reports of the following cases of adenoma of the small intestine associated with intussusception have been published:

Keilty (10): Male, age 23. Adenoma of jejunum with intussusception. Succumbed.

Ludlow (13): Young male adult. Adenoma of jejunum with intussusception. Operation. Recovery.

So far as I have been able to ascertain, only 17 authenticated cases of adenoma of the small intestine associated with intussusception have been reported. The addition of my 2 cases brings the total number to 19.

The manner in which the intussusception is produced has never been satisfactorily explained. The view which seems most natural to accept is that the body of the tumor, lying within the lumen of the intestine offers an object which the wave-like contractions of the circular muscle can grasp and force onward, exactly as they do with a bolus of food. As a result of this forcing onward of the tumor, traction is exerted on its point of attachment, tending to pull inward and downward this part of the intestinal wall, thus starting an intussusception, which is increased by the subsequent waves of peristalsis. This method of formation seems to have been demonstrated in the cases reported by Fuchsig (4), Smoler (17), Brataud (1), and Watts (18), where milking the tumor downward caused a depression in the wall of the gut at the point of the tumor's attachment and, later, a beginning invagination.

Against this theory, two objections have been raised: First, in a certain number of cases where tumors have given rise to intussusception, the tumor has not occupied the apex of the invagination. This, it seems, to me, does not disprove the theory. If we accept the view that the intussusception is sometimes formed and may then undergo spontaneous reduction, it is at least possible that those cases where moderately large tumors are not at the apex of the intussusception represent instances where the process of reduction is taking place, the waves of reversed peristalsis having seized the tumor and carried it backward.

On the other hand, those cases where many small tumors are accompanied by intussusception cannot be explained by this "mechanical" theory. Here we are forced to accept the explanation of some abnormal "stimulus" to the intestinal wall. Attempts have been made to explain the mode of action of this "stimulus," but one is forced to conclude that none of the explanations is satisfactory. Nothnagel and Morris (9) believe that

a spastic contraction of a portion of the gut occurs and this contracted part forms a fixed point, the intestine immediately below being drawn up over it, forming the intussuscipiens, while the contracted part is the intussusceptum. Peyer (9) and Leichtenstern (11) hold, on the contrary, that the essential condition leading to intussusception is a localized paralysis of the intestine; the paralyzed part, according to Peyer, forming the intussuscipiens; to Leichtenstern, the intussusceptum.

The records of certain surgical clinics also seem to indicate that adenoma of the small intestine necessitating surgical intervention is rarely encountered. Thus, King states that no such case occurred among 44,654 abdominal operations at the Mayo Clinic, nor did any appear in the records of the abdominal operations at the Charity Hospital of New Orleans "for many years back," although about 10,000 operations were performed annually at this institution.

In approximately 25,000 operations at the Boston City Hospital, adenoma of the small intestine was encountered only once, and was not associated with intussusception.

In spite of this evidence, I am inclined to suspect that adenomata as well as other benign tumors of the small intestine are not so extremely uncommon. When one reviews the histories of practically all of the reported cases, two striking features are to be observed: first, the patients were seriously ill when they came under the care of the surgeon; and, second, there is good reason to believe that similar, but less severe disturbances had taken place in the past but spontaneous relief had occurred. This latter point is well illustrated by the 3 cases I have reported. In all of them the history strongly suggested the previous occurrence of intussusception, and the appearance of the intestine at operation in Case 2 proved that such an occurrence had taken place.

It has been demonstrated that pedunculated tumors may be torn from their attachment (9), and I believe that this may not be very uncommon. It seems not unlikely that the constant pressure and tension may cause the new-growth to atrophy in some cases; while in still others, they may never attain sufficient size to cause any disturbance. Finally, we must remember the possibility of benign tumors undergoing malignant degeneration and admit that a certain proportion of intestinal carcinomata and sarcomata may have originally existed as adenomata or myomata.

It does not seem unreasonable, therefore, to assume that the patients who are critically ill, whose condition is such as to demand immediate surgical intervention, constitute only a small proportion of the cases of benign intestinal tumor and the possibility arises that a certain number of individuals who suffer from recurring attacks of abdominal pain may owe these symptoms to the presence of a benign tumor of the intestine. This view is strongly supported by the autopsy records from the Boston City Hospital which were recently communicated to me through the courtesy of F. B. Mallory. In a total of 4,165 autopsies, adenomata of the small intestine were encountered four times, giving an incidence of almost one case of every thousand that came to autopsy. Benign tumors of all kinds were encountered in eleven instances.

In addition, through the kindness of Drs. Wright and Richardson of the Department of Pathology of the Massachusetts General Hospital, Mr. A. M. Bagusin investigated the records of 3,327 autopsies performed at that institution. A total of eight benign tumors of the small intestine was encountered in this series, but only one adenoma.

The fact that my own cases were operated on at a time when obstruction due to intussusception had produced a serious abdominal emergency, indicates that tumors of the small intestine may be an etiological factor in the intussusception of young children. There are several reasons for overlooking a tumor of the small intestine when operation is done for the resulting intussusception.

If the invaginated gut is reducible, and resection not advisable, a small tumor projecting into the lumen may easily escape detection, owing to the œdema and infiltration of the intestinal wall.

It is also reasonable to assume that a pedunculated tumor occupying the tip of the

invaginated gut, and therefore the zone of great ischæmia, would be destroyed by gangrene in many cases, while the gut with its nutrition less impaired might regain its normal vitality after reduction of the intussusception and the application of moist heat.

Operations for intussusception in young children are often grave emergencies and the surgeon is chiefly concerned in making a decision between simple reduction and excision of the invaginated gut. It is reasonable to assume that many specimens of intestine removed at operation for intussusception, if carefully studied, will show the remains of a tumor, spontaneously destroyed by interference with its vascular supply.

This hypothesis is not submitted as an explanation of all cases of intussusception in children. More and better study is necessary to determine the relationship between tumor and invagination.

CONCLUSIONS

In conclusion, the following points seem to deserve especial emphasis:

1. The possibility, or indeed, the probability exists that benign tumors of the small intestine are of more frequent occurrence than the number of cases reported from surgical clinics would lead one to suspect.

2. There is no reason to believe that the material from the Boston institutions is unique and that Bostonians suffer from benign intestinal tumor more than persons in other localities. Accepting this, we face the striking fact that approximately one person in every 1,500 coming to autopsy shows the presence of adenoma of the small intestine. Even more striking is the fact that in the 7,492 autopsies, benign tumors of the small intestine were encountered 19 times, so that we have an incidence of nearly one to every 400 autopsies.

3. In considering the few cases of adenoma that have been reported by surgeons, it must be remembered that many of the so-called "polyps" are adenomatous in structure, but cannot be included because of the failure to make a histological examination of the tumor.

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DEPARTMENT OF TECHNIQUE

SOME PLASTIC OPERATIONS ON THE RECTUM

By HARVEY B. STONE, M.D., F.A.C.S., Baltimore

THIS article is written to present, as briefly as possible, four operative procedures for the correction of rectal conditions of various types. Descriptions of some of them have been published before but are again described because they seem worthy of further notice.

1. In a certain number of cases following Whitehead operations for hæmorrhoids, the mucocutaneous margin instead of being within the anal canal is externalized; that is, a ring of everted mucosa extends around the anus. This probably results from the neglect of a precaution emphasized by Whitehead himself; the careful preservation of all skin so that the mucosa will not be pulled down and outside the sphincter in order to make the repair suture at the end of the operation. When such a condition exists there is a constant moisture about the anus, with erosion of the everted mucosa, pain, and bleeding. To correct it the following plan has been successful.

With the patient in the perineal position, two V-shaped incisions in the skin on each side of the anus are made. The angle of the V is placed about over each ischial tuberosity and one arm runs forward toward the center point of the perineum and the other back toward the tip of coccyx. These incisions, however, are not carried across the midline either anterior or posterior to the anus, but end about 1 inch lateral to the midline on each side. The flap of skin enclosed between the V on each side is loosened up but not extensively undermined, and is pushed medianward toward the anal margin. The outer edges of the V incisions are then sutured to each other, converting the V into a Y and crowding the enclosed skin area toward the anus and holding it there.

The faulty mucocutaneous margin is then divided by a circular incision, the mucosa dissected upward into the anal canal until a cuff of it is freed all around, and this cuff then amputated. The mobilized skin edge is then sutured to this shortened mucosa, pulling it well up into the anal canal. In short, this part of the operation is simply a repetition of the original Whitehead, with a mobilized and sufficient skin margin to repair the fault of the first operaton (Fig. 1).

2. In certain special types of stricture of the rectum, an application of the principle of the Heinecke-Mickulicz pyloroplasty is helpful. These strictures are of the diaphragm type; that is, firm, with small lumen, but narrow, and annular in their involvement of the long axis of the bowel. The stricture is incised in the posterior midline down to its base, and the superior and inferior edges of the incision are sutured to each other, so that the line of repair runs transverse to the long axis of the bowel. After having employed this measure several times, I found that it had already been described by Arthur Dean Bevan, in the *Surgical Clinics of Chicago*, in 1917.

3. In tubular strictures of the rectum, occurring in the lower 4 inches of the bowel in multiparous women, the utilization of part of the voluminous vaginal mucosa as a transplant into the rectum has been tried. This has been done only when long-continued dilatations have failed to give relief, and where the Wassermann test has been for a long time negative. The posterior vaginal wall is incised longitudinally in the midline, exposing the strictured rectum from in front. Some of the scar tissue about the rectum is dissected away, and then it is incised longitudinally in the anterior midline. The edges of the vaginal incision are sutured to the corresponding edges of the rectal mucosa, thus forming a rectovaginal fistula, then on each side of this fistula a flap of vaginal mucosa about an inch wide is outlined, and its outer edge dissected up, leaving the inner portion about the rectovesical fistula still attached. The freed outer edges of these two flaps are turned over toward each other, and sutured together in the midline, thus causing the flaps to fold over and face downward toward the rectum. The remaining vaginal mucosa is then brought together over these reversed flaps, burying them in the rectum, and the posterior vaginal wall is repaired. This procedure implants two, inch wide strips of mucosa in the rec-

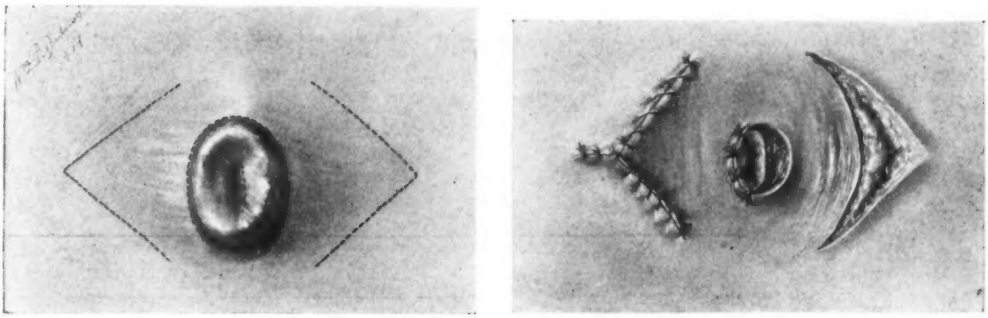


Fig. 1. Incisions and sutures for repair of faulty Whitehead operations with everted mucous membrane.

Fig. 2. A sagittal section showing type of stricture in which vaginal mucosa may be utilized.

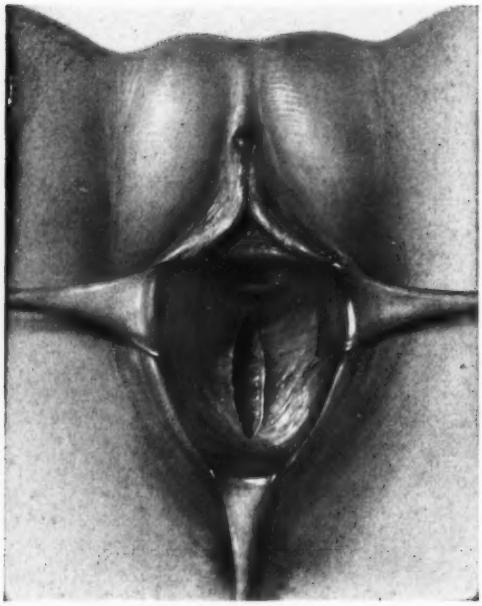


Fig. 3. Incision in midline of posterior vaginal wall.

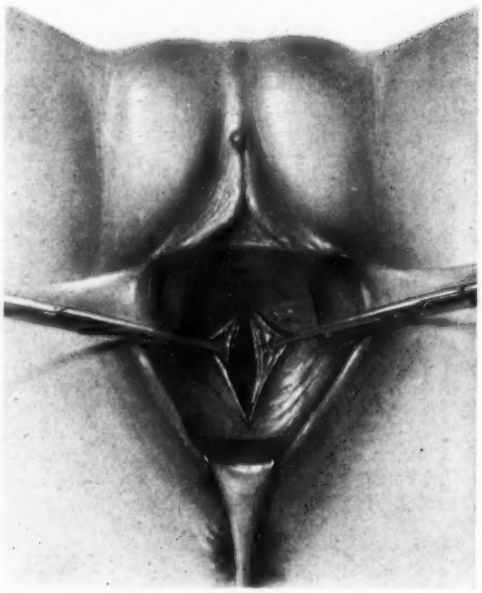


Fig. 4. Incision carried through anterior wall of rectum, dividing stricture.

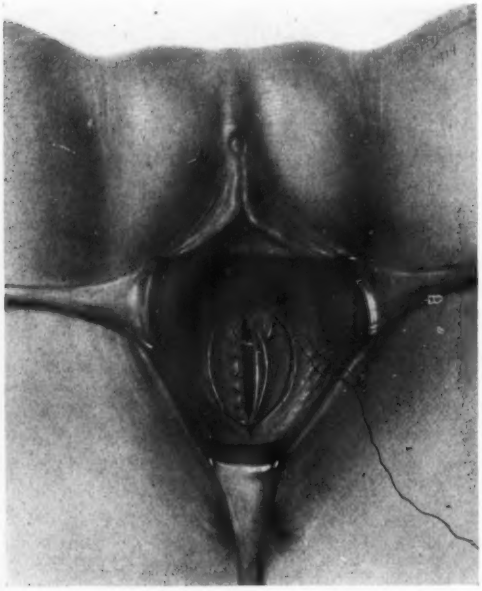


Fig. 5. Suture of rectal and vaginal margins and outline of vaginal flap.

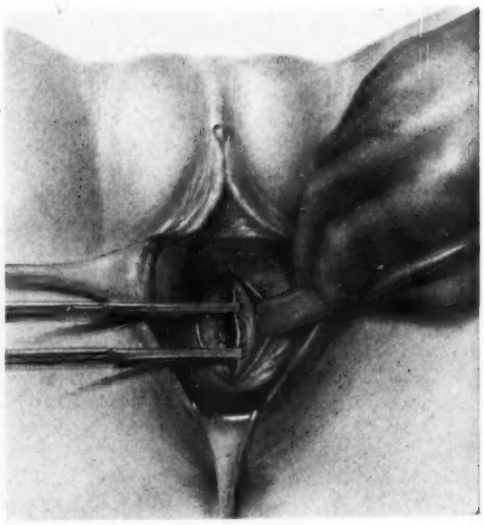


Fig. 6. Freeing of edges of vaginal flap.

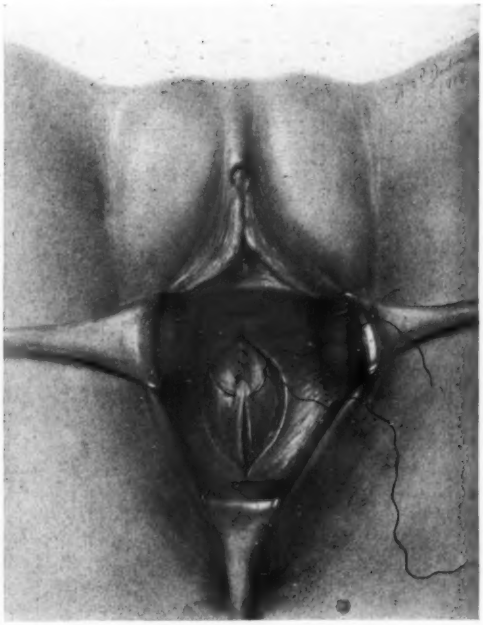


Fig. 7. Outer edges of vaginal flap sutured together across the midline.

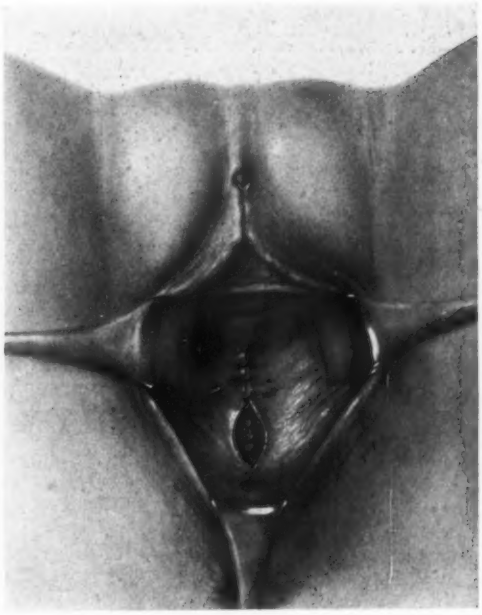


Fig. 8. Repair of posterior vaginal wall.

tum and widens the stricture very materially (Figs. 2, 3, 4, 5, 6, 7, and 8).

4. With the collaboration of Hugh H. Young, an operation has been devised for the correction of recto-urethral fistula in the male. Case reports with details of a number of such operations have been published elsewhere. In this paper only an outline of the method will be given. The first step is the establishment of urinary drainage by a suprapubic cystostomy. Then a midline incision in the perineum, begun at the midpoint of the perineum, is carried backward to the anterior anal margin, and then about the anus at the mucocutaneous junction. The bowel is then dissected upward as in a Whitehead operation, and the sphincter divided in the midline anteriorly. The incision permits the exposure of the deep urethra through the perineum and the mobilization of the rectum, which is dissected loose all around, to a point well above the entrance into the bowel of the fistula. This dissection, of course, divides the fistula. The urethral orifice of the fistula is now closed by sutures placed over a sound. The bowel is brought down until the rectal orifice of the fistula is drawn outside the skin level and fixed in this position by stay sutures. The perineum is reconstructed by drawing the muscles together and the sphincter is repaired. The distal extremity of bowel, bearing the fistula, is amputated, and the stump of proximal bowel sutured to the anal skin as in Whitehead repair. The perineal incision is also closed. The advantages of this operation are direct closure of the urethral orifice, the complete removal of the fistulous area of rectum, the interposition of perineal structures between rectum and urethra, and the temporary diversion of the urine. It has proved very successful in practice.

A NEW AND EFFICIENT METHOD FOR THE USE OF WIRE IN SURGERY OF THE BONES

By JAMES M. NEFF, M.D., F.A.C.S., and JOHN G. O'MALLEY, M.D., Chicago

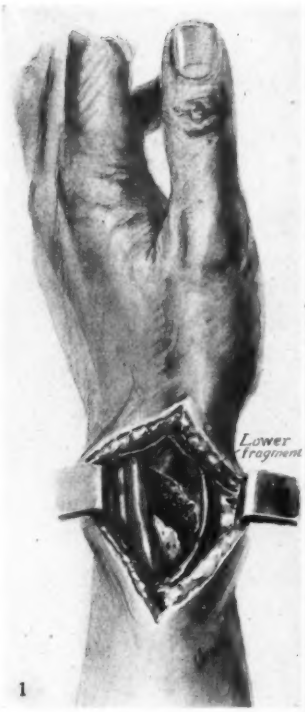
THE use of wire in surgery of the bones has a limited field but that it has a very definite place, in which no other method is practicable, must be admitted by all surgeons. During our service with the British army in France in 1915, we evolved a method which we believe to be new and original with us and, furthermore, cannot be improved upon. As regards the indications for the use of wire, they are practically unlimited but those which we have encountered may be summarized as follows:

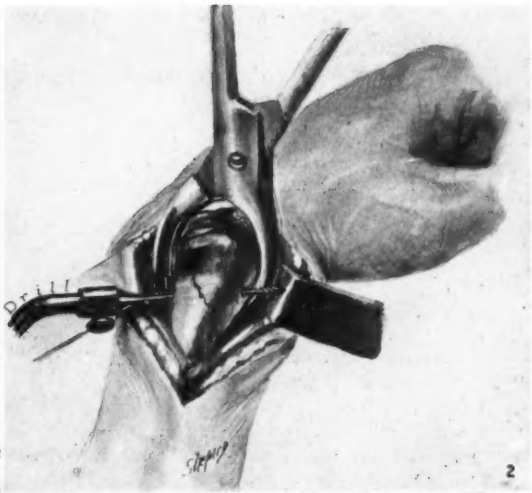
1. The holding of any small fragment in apposition with a larger fragment where it cannot be done by the closed method; for instance, (a) a short lower end of the radius displaced forward and upward where the flexors act strongly and overcome the extensors; (b) the holding in place of certain bone transplants so that they will remain in strong and accurate apposition—something that cannot be done in the majority of cases with kangaroo tendon, or chromicized catgut; (c) the holding in position of bone fragments in comminuted fractures such as of the lower end of the humerus, where it is essential that these fragments be held in place and remain so until union takes place; (d) fractures of the lower jaw where the fragments will not remain in place and where it is inadvisable for certain reasons to use an interdental splint; (e) in oblique fractures of the clavicle where a plate cannot be easily and safely applied; (f) in fractures of the patella and the olecranon process of the ulna.

These indications have come to our attention, but the method may be elaborated to cover any number of conditions which may arise in the practice of bone surgery. We do not advocate it in fractures of the long bones, where very strong support is needed to hold the fragments in apposition, as in the shaft of the humerus, femur, tibia, or both bones of the forearm. In these we are firm advocates of the use of the Lane plate applied after Lane's "no-hand contact" method. We make this assertion after an enormous experience in both military surgery in France and civil surgery here. In the above indications, we refer only to simple fractures, but the wiring process, which will be described later may be used in many compound fractures where slight support is indicated.

Now, as regards the technique of our method which was evolved by us in France in 1915: Let us take as a typical example for illustration a fracture of the lower end of the radius, produced by falling on the back of the hand and in which the plane of fracture is from behind forward and upward with a displacement of the small lower fragment in the same direction (see Case B). In such cases it is impossible to hold the lower fragment in position by the closed method because of the strong flexor tendon pull. The technique of the operation is extremely simple. We follow Lane's method throughout, as we do in all bone and joint operations; that is, the fingers do not enter the wound and all instruments and sutures introduced into the open wound are not touched by even the gloved hands of the nurse or surgeons.

An incision is made over the outer side of the lower end of the radius parallel to the long axis of the shaft. Wound towels are sutured to the margins of the skin, and the tendons of the extensor brevis pollicis, extensor carpi radialis longior and brevior are exposed and retracted. This brings us down to the bone, both proximal and distal to the fracture (Fig. 1). A periosteotome is now used to clear the surfaces of the bone at the site of fracture and all structures are retracted. With a medium sized lion jawed forceps the lower fragment is brought into absolutely accurate approximation with the shaft and held there by another lion jawed forceps, which firmly grasps both fragments. An ordinary bone drill is now used to drill through both fragments at their point of greatest density (see Fig. 2). A silver or copper wire of proper gauge, which has been previously prepared (to be described later), is passed through the drill holes of both bones, brought out to the surface and caught by forceps at each end. The wire is now drawn taut in opposite directions so as to hold the fragments firmly in accurate apposition. This is done by having an assistant make traction on one end of the wire while the operator does likewise with the other, as will be seen by illustration (Fig. 2). This procedure brings the terminal portions of the wire in lateral and parallel contact with each other. Over the adjacent parallel wires a small quantity of liquefied zinc chloride is applied with any kind





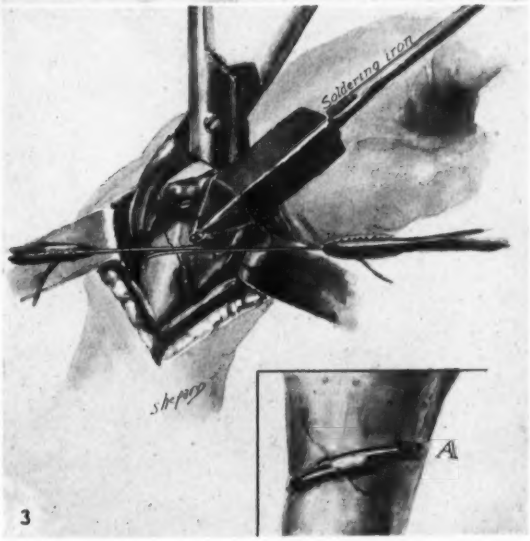


Fig. 1. Incision to bone, showing fracture and extensor tendons.

Fig. 2. Fragments held in place, with drill going through bone at point of greatest density.

Fig. 3. Fragments in place with wire through drill hole ready for soldering. Insert *A*. Fragments united with soldered wire in place.

Fig. 4. Case A. Before operation. Internal condyle shows, but external condyle is not present in roentgenograph.

Fig. 5. Case A. After operation with condyles united by soldered silver loops. Condyles united to shaft by Y Lane plate.

of metal applicator, such as an ordinary hæmostat. An ordinary tinner's soldering iron properly prepared (to be described later) is used by the operator for the purpose of picking up a small drop of electrician's solder and, while proper tension is exerted by operator and assistant in pulling the ends in opposite directions, the adjacent parallel portions of the wire are soldered together by merely running the tip of the iron carrying the molten solder over them (Fig. 3).

This procedure requires but a moment and, when finished, we have a complete circular band of metal firmly uniting the fragments in perfect apposition, with no possibility of ever loosening or breaking. With an ordinary bone-cutting forceps the unused part of the wire on each side of the soldered portion is now cut flush with the band uniting the fragments (Fig. 3, insert *a*).

As formerly used the wire was twisted upon itself, cut off, and the ends turned down. During this extremely unmechanical procedure the wire was very often broken during the twisting or turning process. There was always an awkward end to deal with and there was no assurance of the wire maintaining its original tension over any period of time.

With the new process described above, the wire band remains forever at the original tension at which it was soldered, there is no possibility of breakage during the soldering process, and there are no awkward ends to deal with. In other words, we have a continuous metallic band which maintains its original tension indefinitely, a smooth surface at the site of union, no irritation from the twisted ends, no possibility of breakage at any time and the assurance of complete asepsis produced by the heat of the "iron."

We consider the method ideal in every respect and by its elaboration should open a new field in bone surgery.

PREPARATION OF THE SOLDERING IRON

An ordinary tinner's soldering iron of medium size is used. With a coarse file the four surfaces of the iron are filed down to a point so that the copper presents a bright glistening surface. It is now heated in the blue flame of a gas stove, or Bunsen burner to a temperature where it will melt the solder upon contact. The tip and one-half or three-quarters of an inch of the four surfaces are now dipped into zinc chloride crystals and then brought into contact with soft electrician's solder. This will tin the soldering iron. In other words, the solder will adhere as a thin film to the sides and tip of the iron. It is now ready for use in the operation.

PREPARATION OF THE WIRE

As stated before, either silver or copper wire may be used. The gauge of the wire will depend upon the size of the bone and the tension that must be used to hold the fragments in apposition. The wire is drawn straight by traction on each end and passed through the blue flame of a gas stove or Bunsen burner in order to burn off any grease that may be present. While it is kept on tension it is rubbed over with liquefied zinc chloride on an applicator. The prepared and heated soldering iron carrying a small drop of solder is now passed over the entire length of the wire and around its circumference. This will cause a thin film of solder to adhere to the wire as it did to the iron. While wire and solder are still hot they may be wiped off with clean dry gauze to carry away any excess of solder and leave a smooth surface. The wire is now ready for operation but should be boiled with the instruments before being used.

The iron is used during the operation by wrapping the handle in a sterile towel as in the use of the Paquelin cautery.

Two cases are reported to illustrate the efficacy of the method.

CASE A. Male, age 47, tripped and fell February 23, 1918, striking on the right elbow. In attempting to arise he again fell upon the same elbow. The arm and forearm were put in cast and nothing further done until the case came to our attention, March 12, 1918. At that time the elbow was greatly swollen and painful with a definite false point of motion about 2 inches above the olecranon. X-ray findings: transverse fracture of the shaft of the humerus 2 inches above the articular surface, with a

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 6. Case B. Before operation, after attempts at reduction had failed.

Fig. 7. Case B. Lateral view after operation, wire holding fragments in place.

Fig. 8. Case B. Anteroposterior view after operation.

Fig. 9. Case B. Lateral view 3 weeks after operation, showing perfect union with wire in place.

Fig. 10. Anteroposterior view 3 weeks after operation.

vertical fracture into the joint separating the condyles. The external condyle was not visible in the roentgenogram (Fig. 4).

Operation, March 13, 1918. Lane's technique followed throughout. A vertical incision was made over the posterior aspect of the arm, elbow, and forearm down to the bones. The X-ray findings were confirmed, that is, we found a transverse fracture of the shaft with a vertical fracture into the joint, splitting and separating the condyles. The internal condyle was rotated inward and was readily brought into place. The external condyle was not to be seen, but upon opening the capsule of the joint it was found to have rotated downward, presenting the articular surface upward. This was now brought into position by the side of the internal condyle. By means of three holes drilled through both condyles, silver wires were passed through, drawn taut and soldered, holding the condyles in firm apposition. The condylar portion of the lower end of the humerus was now secured to the shaft by means of a Y-shaped Lane plate, the limb of the Y being screwed to the shaft of the humerus and each lateral arm to the internal and external condyle respectively (Fig. 5). The ulnar nerve was protected throughout by being carefully drawn aside after its isolation. No drainage was used and the skin was closed by catgut suture. A plaster-of-Paris cast was applied, and the arm put up at an 80 degree angle. Union was firm and complete 7 weeks after operation when great callus formation showed in the roentgenograph. In order to secure proper function in the elbow-joint, this callus was removed and a piece of the superficial triceps aponeurosis was interposed between the articular surfaces of the humerus, ulna, and radius. At the time of last operation the plate and wires were removed.

Case B. Male, age 18; while playing football December 2, 1919, was thrown to the ground, falling backward. In attempting to save himself he placed his right arm back of him and fell with the dorsal surface of the hand striking the ground. Patient suffered great pain at the time, and the wrist began to swell immediately. He was taken to a hospital where, two days later, an attempt was made to reduce the fracture. This and two succeeding attempts under general anæsthesia were unsuccessful in holding the fragments in position. He was then brought to Chicago where roentgenogram showed a fracture of the lower end

of the radius with the lower fragment displaced forward and upward (Fig. 6). Another attempt was made to reduce the fracture and hold the fragments in apposition with the closed method. This was not successful.

Operation, December 6, 1919. Lane's technique followed throughout. An incision two and one-half inches long was made over the outer surface of the lower end of the radius, the extensor longus pollicis, extensor carpi radialis longior and brevior tendons exposed and retracted, and the fracture brought into view. The fragments were now brought into apposition by means of a lion jawed forceps and held there while, with an ordinary bone drill of small caliber, a hole was bored through both fragments at the point of greatest density. The previously prepared silver wire was then passed through, drawn taut and soldered, after the manner described in the technique. Roentgenographs were taken immediately, showing fragments held in perfect apposition (Figs. 7 and 8).

The wound was closed in the usual way, catgut being used in the skin and a posterior cast applied. The patient made an uneventful recovery and at the end of 3 weeks, the cast was removed. The skin suture had absorbed, the wound healed by primary union, and passive motion was begun. Roentgenograms taken 3 weeks after operation show the wire in position, the fragments in perfect apposition, and union perfect (Figs. 9 and 10).

A MODIFICATION OF THE USUAL METHOD OF PERFORMING PUBIOTOMY [1]

By HENRY JELLETT, M.D., F.R.C.P.I., Dublin, Ireland
Late Master, Rotunda Hospital

UP to the present time two methods of performing pubiotomy have been described and are in common use: The semi-open method of Doederlein, and the subcutaneous method of Bumm. Each of these possesses certain advantages and disadvantages. In the Doederlein method, the bladder is separated by the finger from the back of the pubic bone after first making a small incision above the bone to admit the finger. In this way injury to the bladder by the needle is avoided, but at the same time a large area is opened behind the bone in which blood may collect and infection subsequently occur. In the Bumm method, on the other hand, the needle is passed upward from below under the guidance of a finger in the vagina. There is no incision made in the skin and no separation of the bladder from the bone and consequently there is less risk of infection.

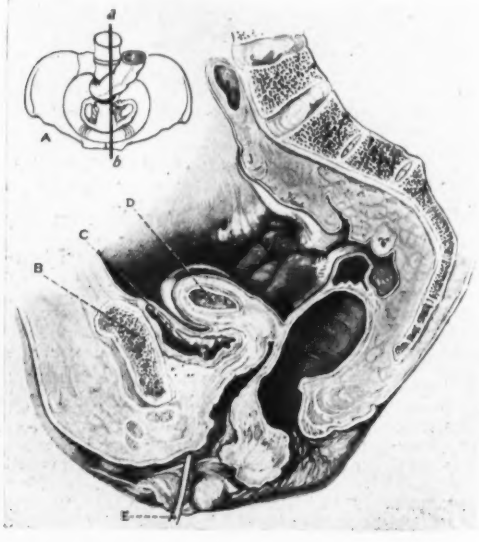


Fig. 1. Section through the pelvis passing through the usual site at which the pubic bone is divided (Liepmann). *A*, Line of section; *B*, cut surface of pubic bone; *C*, bladder; *D*, uterus; *E*, pointer in urethra.

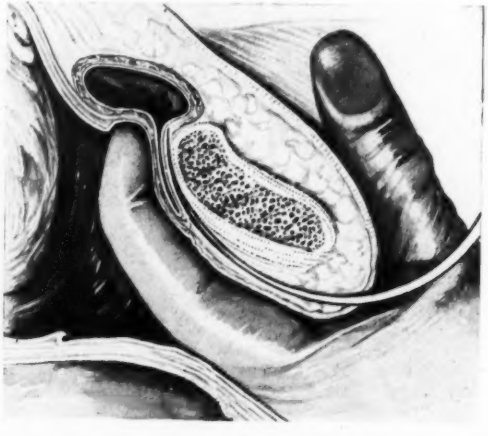


Fig. 2. Diagram to show the manner in which the guiding finger in the vagina can push the bladder into the track of the needle.

[1] The following is a short addendum to an article on "The Radical Cure of Pelvic Deformity" which appeared in Surgery, Gynecology and Obstetrics, for August 1919, 117.

Fig. 3. The passage of the needle in the modified operation.

There is, however, a considerable risk of injuring the bladder with the needle.

The ease with which the bladder can be penetrated by a needle passed upward from below can be seen if the relations of the bladder and bone are examined in Figure 1, while the diagram in Figure 2 shows very plainly the manner in which the guiding finger in the vagina may actually push the bladder forward in the direct path of the needle. It may be said that, if the needle is kept between the periosteum and the bone, it cannot enter the bladder. This is, of course, true, but it is impossible to construct a needle with such a curve as to enable it to keep within the periosteum as the upper surface of the bone is reached, even if it has done so all along the posterior surface. The upper part of the bone is the danger point, and the danger is exaggerated by the guiding finger in the vagina.

Accordingly, I have for the past few months been in the habit of performing a slight modification of the Doederlein operation, as follows:

A small incision is made in the skin and fat directly above the point of proposed entry of the needle. This incision is carried down to the bone, and the periosteum is cut through where it passes off the upper surface on to the posterior surface. The point of the blunt Doederlein needle is then pushed through this opening and downward

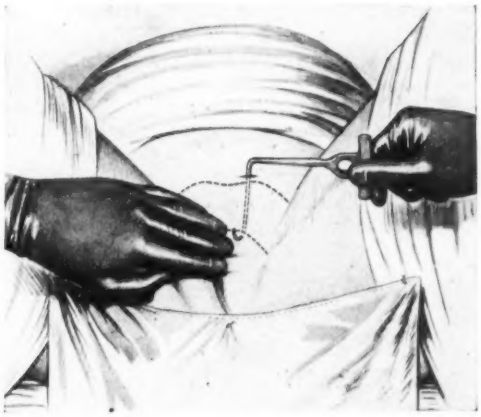


Fig. 4. Diagram to show the correct track of the needle.

beneath the periosteum (Fig. 3). The finger is only passed into the vagina, as a guide, as the needle reaches the lower edge of the bone, and even then it is not essential (Fig. 4).

The only point on which special care is necessary is in making the incision in the periosteum. If this is made directly on top of the bone, it will not be possible to detach the periosteum with the needle, as it is too firmly attached at this point. If, however, the incision is made just over the upper surface of the bone, it is usually easy to cause detachment.

It may further be said in favor of this method that, even if the needle fails to keep behind the

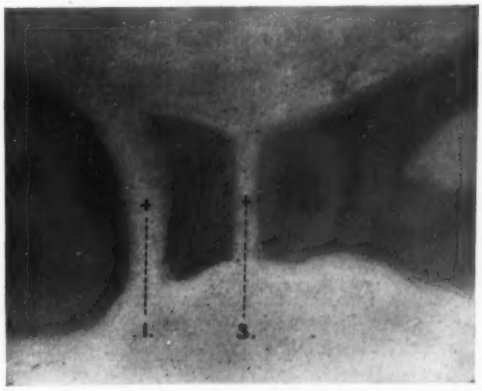


Fig. 5. Skiagram of the pubic bone after a double pubiotomy. The arrow points to the first incision with complete ossification. *I*, the second non-ossified incision; *S*, the symphyis.

periosteum, the danger of penetration of the bladder is only a fraction of what it is when the needle is passed up from below, as in the Bumm method.

I also wish to take this opportunity of reproducing a roentgenogram of the pubic bone of Mrs. G. (Cases No. 17 and 23) in my previous article (Fig. 5). This woman had a pubiotomy done by me on the left side (to which the arrow points) in 1913. She was kept very quiet after the operation with the result that bony union followed and that she was unable to deliver herself at her next confinement in 1916. In consequence pubiotomy was performed by Dr. Purefoy. This time bony union did not occur, with the result that at her next confinement in 1919 she was delivered with the forceps of a living 8½ pound child the forceps being applied on account of uterine inertia and not on account of any mechanical difficulty.

A WARNING AGAINST PROMISCUOUS UTERINE CURETTAGE[1]

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OF all gynecological operations performed probably the most frequent is curettage of the body of the uterus.

The invention of the uterine sound by James Y. Simpson caused exploration of the uterus with it to be a very popular procedure. One can be thoroughly convinced of that by merely consulting the *Index Catalogue of the Library of the Surgeon General's Office.* There will be found an overwhelming number of titles on the subject, and one reading even a small number of the papers there listed under the proper heading can not but be impressed with the pervading enthusiasm.

Jennison's sound, brought forward some years later, also became a favorite instrument. Its use was largely in the reposition of the retroverted uterus. I plead guilty to "triumphantly" using this instrument in 1896 and 1897. The pain thus induced when adnexal adhesions unknowingly existed is well remembered. Possibly damaging infection may have been produced by my nefarious efforts.

The uterine curette, introduced to an embryonic state of development of gynecology, as it was, rapidly attained a high degree of popularity that has continued with but slight lessening of late. That the most slovenly and ignorant physician resorts unhesitatingly to the curette for various diseases of the uterus, real or otherwise, and even of the appendages is a notorious fact. It is equally true that curettage in the office of a physician with a very lax degree of surgical cleanliness is commonly done.

That curettage has a field in gynecological procedure is not to be doubted, but the ring of limitation around it is constantly narrowing. The narrowing is not comprehended by the majority of our profession, and to those its practice is far too simple to appear dangerous, and besides it tends to easy progress toward being known as surgeons.

INDICATIONS

The principal reasons for curetting the body of the uterus are to secure material for diagnostic purposes, to remove mucous polypi in the treatment of exfoliative endometritis, calcareous areas formed by calcified submucous fibroids, and some rare cases of senile endometritis, especially following senile pyometra of chronic endocervicitis, of certain rare forms of chronic endometritis, of certain equally rare cases of hypertrophy of the endometrium, of sterility—and to remove the products of conception that can not otherwise be extracted. The principal use of curettage is to secure endometrial tissue for microscopical study.

If we contrast this scope of the indications for curettage, as legitimized by progress in scientific medicine, we will at once note its conflict with the daily routine application of this surgical procedure. It is with a sense of great loyalty to my profession that I recall with deep humiliation the many former indications for curettage which have been discredited.

Among these were the routine curettage, incident to pelvic plastic surgery. If repair of injury to cervix or vaginal wall or perineum was to be made, curettage was added and its technique included gauze drainage or irrigation, one or both. A snap diagnosis of chronic endometritis was usually the term that was added to the

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TABLE SHOWING INCIDENCE OF BACTERIA IN CULTURES FROM GROUND ENDOMETRIUM OBTAINED AFTER HYSTERECTOMY

Type of cases	Number of cases	No growth	Total number	Gonococcus	Streptococcus	Diplococcus	Diphtheroid	Bacilli gram	Mixed	Remarks
Nullipara without history or gross evidence of infection	26	23	3		1				2	The two cases with mixed growth were curetted a few days previously.
Nullipara with history or gross evidence of infection	13	12	1	1						One case revealed chronic tuberculosis. No bacteria were obtainable from one case with distinct inflammatory changes.
Parous women without history or gross evidence of infection	47	43	4		1*		1	1	1	1* anaerobic. Mixed growth from a case subjected to preliminary intra-uterine manipulation.
Parous women with history or gross evidence of infection	32	23	9	5	2	1	1			One streptococcus case packed to control bleeding two days before operation. All others except diphtheroid bacillus case yielded similar growth from the fallopian tube.

operative diagnosis. Microscopical examination of the scrapings was rarely made and still more rarely recorded. Sometimes variations in diagnosis were noted such as chronic metritis, chronic hyperplasia, subinvolution, etc. Ofttimes the only symptom of these various diseases was a uterine discharge which was manufactured by the cervical mucosa. A very common indication, now discarded or discredited, was incomplete abortion, and if fever was present the operation was considered imperative and of a "life-saving" type. We now know that invasion of the vagina or uterus in such conditions is not only very hazardous but decidedly unnecessary; that, except in case of very dangerous hæmorrhage, such conditions are best treated without such invasion.

As a supposed stimulant, curettage has been often employed in treating uterine hyperplasia. The philosophy of it was illy founded. Cure of cancer of the uterine body has apparently been secured by curettage. Possibly the disease in these instances was so early and superficial as to have been entirely removed by the curette, and yet here we are confronted by many warnings of the danger of cancerous contamination in cutting surgical operations for this disease. Ignoring these well founded warnings, one can scarcely lay claim to such refinement in pre-operative diagnosis as to be able to select cases for such treatment of cancer of the uterine body. In metrorrhagia incident to retroversion of the uterus, it is common practice to curette without effort to right the malposition. In this type of hæmorrhage the use of a proper pessary is usually ample treatment. In other uterine hæmorrhages, from cardiac or other conditions outside the uterus, the curette is too often employed in place of careful study of the causes. Especially is this the case when loss of endocrine equilibrium is the cause.

DANGERS

It is well to point out the many dangers incident to uterine curettage. Not infrequently is a pregnancy in its first month thus scraped from the uterus and perhaps never recognized. Certainly humiliation has often come to the operator by discovering during curettage that an unsuspected pregnancy has been interrupted. Very often, too, pregnancy has unnecessarily been ended by curettage for incomplete abortion. The literature teems with reports of cases of perforation of the uterus by the curette with or without dangerous sequelæ and even death. In the *Index Catalogue* mentioned are found titles like these: "Resection of 70 Inches of Intestine after Perforation of the Uterus with the Curette"; "Perforation of the Puerperal Uterus: Pelvic Peritonitis; Drainage of Uterus and Parametrium; Colpotomy; Recovery"; "Two Cases of Death Following Curettage with Perforation of the Uterus"; "Laparotomy Three Hours after Curettage and Perforation of the Uterus; Seventeen Centimeters of Gut Drawn out of the Uterine Cavity; Uterine Wound Closed: Recovery." Infection plays a major part in the fatal cases usually and to a lesser degree in the remaining ones. For various and ofttimes obvious reasons by far the larger number of such perforations are not published. Nor are they, by any means, confined to the unskilful operator. Often infection without perforation is a sequel and often latent tubal infection is thus aroused to activity.

"Hyperpyrexia Following Curettage of the Uterus" is another title found in medical literature and is quite *à propos*.

How often curettage brings away a premenstrual thick membrane that brings from the pathologist a report of chronic endometritis! Close questioning of the latter brings slow admission that no genuine characteristics of existing inflammation were present. But the surgeon is cheered by the confirmation of his diagnosis and he has no doubt of correctness of both diagnosis and treatment. The invaluable paper of Arthur H. Curtis furnishes much valuable information concerning the bacteriology of the endometrium with and without instrumentation of it and I take the liberty of copying his table of results.

We find in this table that in 26 nullipara, *without* history or gross evidence of infection, 23 gave no growths from the endometrium and in 2 of the 3 furnishing growths, mixed infection was found. These two patients had been curetted a few days before.

In 13 nullipara *with* history or gross evidence of infection but one showed a growth—the gonococcus.

In 47 parous women *without* history or gross evidence of infection but 4 showed growths. In 1 of these, a prolapsed uterus removed *per vaginam*, a few colonies of short gram-negative were found scattered among several tubes of media—probably from contamination in operation. Another showed contamination by diphtheroid bacilli, leaving but 2 cases for consideration. In 1 of these curettage and dilatation were done as a preliminary to hysterectomy. In the remaining case curettage was done 7 years before for persistent bleeding following spontaneous abortion. Thirteen months before hysterectomy, bleeding again ensued and became a constant oozing. In this case were found numerous pus cells and several colonies of anaerobic streptococci in pure culture.

In 32 cases of parous women *with* history or gross evidence of infection, 9 showed growths. One case, with hæmolytic streptococci in cultures, had been packed to control hæmorrhage 2 days before hysterectomy. One other, opened at operation, furnished only diphtheroid bacilli. Eliminating these 2 cases, 7 infected ones remain, of which 5 showed chronic gonorrhœal infection in endometrium and tubes, and 1 nonhæmolyzing streptococci in endometrium and tubes.

Curtis concludes that the endometrium of nullipara, without history or gross evidence of pelvic infection, is almost invariably free from bacteria and microscopically normal. That almost all women who have undergone normal pregnancy, with pelvic history otherwise negative, likewise possess bacteria-free endometria. That patients with a history of chronic infection, from whose endometria bacteria are obtainable, almost all have salpingitis with equally good growth and, that pyometra and recent exploration of the uterus excepted, the endometrium almost never shows bacteria except when there is infection of adjacent pelvic tissues and that chronic endometritis, *per se*, with bacteria present in smears or cultures, is practically to be ruled out as a clinical entity.

Such data indicts the curette and other instruments when introduced through the cervical canal into the uterine cavity. The cervical canal is so constantly infected that it does not seem strange, infection may be carried from it into the uterine cavity by curette, sound or dilator. Again, it is shown by Curtis that infection of the endometrium is nearly always associated with similar infection of the tubes and most often gonorrhœal. Curettement under such conditions is strongly contra-indicated. It would seem, then, the dangers from curettage are ever present, whether in the hands of the skilled surgeon or in those of his less fortunate confrère, or of the midwife, and should be practically excluded from the infected uterus. If chronic endometritis as a clinical entity is to be ruled out, one potent indication for curettage in the past will be removed.

If bringing this subject to your attention will appeal successfully to your aid in bringing about harmony between the use of the uterine curette and the teaching of gynecological pathology and bacteriology, I will be deeply gratified.

MODERN METHODS IN THE REMOVAL OF PROJECTILES[1]

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In the summer of 1918 our hospital in France was provided with the surgical X-ray cabinet of Dr. Ledoux Lebard and box tube-carrier of Teillar working on wooden tracks under an aluminium operating table. We at once made use of this apparatus for the removal of foreign bodies under direct vision of the X-rays. Hitherto we had had to do this work with the help of the vibrator of Bergonié and X-ray plates taken at the neighboring military hospital. We fitted up our X-ray plant in the anæsthetic room which opened off the theater and by means of a long cable for the electric current, we were able to place the X-ray cabinet in the theater itself. The tube under the special operating table was connected up to the X-ray cabinet by heavily insulated cables. To avoid having to darken the theater or work in an artificial red light as recommended by Bergonié, we used the bonnet of Dessane. In this, when the anterior part of the bonnet is lifted, a screen of dark red glass automatically closes the aperture of the eyepiece.

There are two distinct methods in which this bonnet may be used: (1) The foreign body having been previously localized, the operator commences the operation and when he has reached the region where the foreign body is supposed to lie, he has the bonnet put on his head, and after pausing a couple of minutes to accommodate his eyes, the X-rays are turned on, and with a probe or blunt dissector, he works through the tissues until he reaches the foreign body, which he may then remove, under the rays, with forceps; or having taken off the bonnet, while the guide is left in position, he may dissect down to the foreign body and remove it by ordinary sight. When there is difficulty in reaching or removing the foreign body, a certain amount of dissection can be done, without removing the bonnet and so losing the accommodation, through the red glass screen which comes into place when the front of the bonnet is lifted. But for this purpose the lighting of the theater must be very good, and it is not safe to attempt fine dissection in the neighborhood of important structures. (2) In the second method the assistant wears the bonnet, and points out the position of the foreign body in relation to the surface, and continues to do so during the various stages of the operation until the foreign body is finally reached. This method is better adapted to those cases in which there are several foreign bodies or in which the object lies in close relation to important organs, necessitating much fine dissection. By a modification of these two methods, the incision is made by the assistant, and the operator wearing the mask, works by direct vision with the rays, using a probe, blunt dissector, or forceps. We used all of these methods in suitable cases with very satisfactory results; and it was most noticeable, although perhaps not so surprising, how easily and through what comparatively small incisions foreign bodies could be removed when deeply situated and in almost any part of the body. The advantage of this method is specially noticeable when the foreign body is situated in bone, as by touch it is practically impossible in most cases to tell the difference between the sensation given when an instrument is in contact with a piece of metal or a rough piece of bone. We have had no experience in the use of the telephone probe, which of course would do away with this difficulty.

The electric vibrator of M. Bergonié proved in our hands a most efficient instrument in suitably selected cases. The principle on which it works is that when an alternating electric current is passed through an electromagnet, vibrations are set up in magnetic bodies in its neighborhood. This vibration can be recognized through a considerable depth of tissues, even when the foreign body is comparatively small; thus the vibration of a small shell splinter not larger than 2 millimeters in its greatest diameter can be recognized, even though the piece of metal is situated at a depth of over an inch in the soft tissues. This apparatus is most useful for pieces of shell, as steel or iron respond powerfully to the electromagnet. Bullets with their metal casing also vibrate fairly well. It is, of course, useless for leaden objects, such as shrapnel bullets or the core of rifle or machine-gun bullets, also particles of certain grenades and bombs. With the help of this instrument we removed large numbers of foreign bodies, some comparatively

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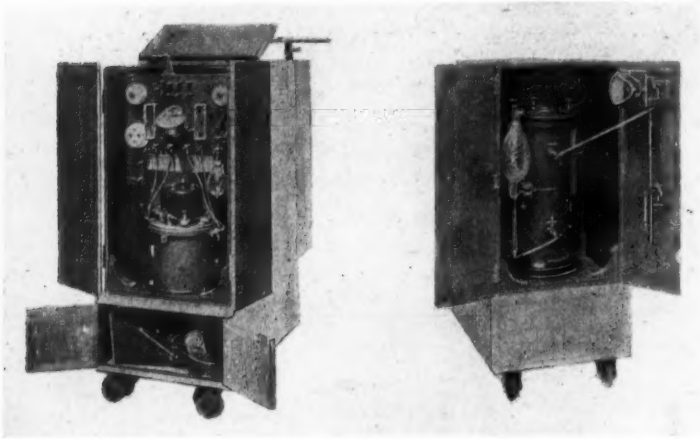

Fig. 1. Surgical X-ray cabinet of Ledoux Lebard. At left, posterior view; at right, anterior view.

deeply situated in the body as in Case 11. Its use is simple in the extreme. The point on the skin where the maximum vibration is felt, is marked, and an incision is made and deepened until the projectile is found; if this cannot be accomplished quickly, the vibrator is brought over the wound, enveloped in a sterilized towel to prevent infection, and the current is again turned on while a finger is kept in the wound. The vibrating body can then be distinctly felt and accurately localized. It is necessary before doing this to remove all metal instruments from field of operation to prevent confusion by the vibrations imparted to them. M. Bergonié has, however, succeeded in having instruments made of an alloy which is not affected by the vibrator.

The following are brief records of some of the more interesting cases. Some of them had already been operated on unsuccessfully at other hospitals, and others had been advised against operation owing to the supposed difficulty or danger. We made the rule that every foreign body should be removed, if the patient consented, provided that the operation did not appear likely to endanger life, or cause permanent injury. The only case in which we refused operation, was that of a soldier who had been wounded by a small shell splinter in the chest, and the X-rays showed a piece of metal the size of a grain of corn, lying in contact with the arch of the aorta, the pulsations of which were transmitted to it. In this case, as there were no symptoms, it was decided that the operation, however interesting, was not worth the inevitable risk.

The danger of X-ray burns is quite negligible, as in most cases the exposure need not exceed 5 minutes, and even this is not continuous, as the current may be shut off from time to time. There might, of course, be a real danger to the operator's hands if a great deal of this work were done continuously.

Case 1. C. P.; soldier, age 33; admitted June 2, 1918; wounded by bullet, May 31, 1918. When admitted the patient presented a comminuted fracture of the lower third of the right humerus, with extensive wounds which were closed by secondary suture. The fracture consolidated well. A roentgenogram showed a slightly deformed bullet in front of the middle of the elbow-joint, close to the bones. Owing to the flexed position of the elbow, it was very difficult to localize the bullet exactly by X-ray photographs. There was also a piece of metal lying behind the upper part of the ulna. Neither piece of metal was perceptibly affected by the vibrator. Operation was performed, August 20, 1918. An oblique incision was made over the front of the elbow-joint in the line of the brachial artery. The wound was deepened between the artery and the tendon of the biceps, then the operator put on the X-ray bonnet, and a blunt dissector was pushed into the tissues through the incision until it was seen to be in contact with the bullet. The bonnet was removed and the dissector was left in position. The opening in the brachialis anticus through which the instrument passed was then enlarged, and the bullet which was lying in contact with the capsule of the joint and directly behind the brachial artery, was removed with forceps. The wound was closed.

A second incision was made behind and to the inner side of the upper end of the ulna. The X-ray bonnet was put on, and by sight the blunt dissector was pushed into the muscles and contact secured with the piece of metal, which was the size of a small pea. The projectile was lifted out on the blunt dissector, still under view by the rays. The wounds healed rapidly.

Case 2. C. G.; admitted July 9, 1918, wounded May 28, 1918 by a shell splinter. The patient had a large healed

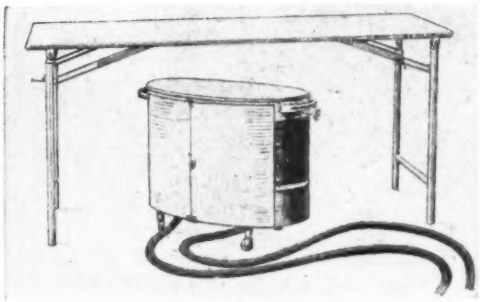

Fig. 2. Box tube-carrier of Teillar, with insulated cables and operating table. (The rails and sliding carrier are not shown.)

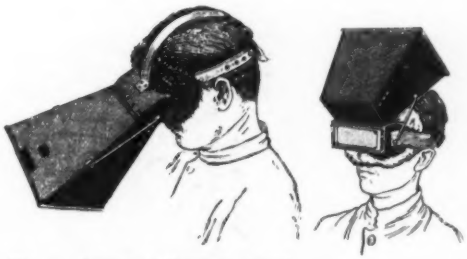

Fig. 3. Bonnet of Dessane, closed.
Fig. 4. Bonnet of Dessane with front raised.

wound on the inner border of the right foot and the X-rays showed a foreign body in the second right tarsometatarsal joint. An attempt had been previously made to extract it. An incision was made along the course of the wound and the sole of the foot was placed flat on the table. The operator donned the X-ray bonnet, and by direct vision pushed a blunt dissector in through the incision until it was seen to be in contact with the piece of metal. It could not be recognized by touch as it was surrounded with rough bone. The blunt dissector was worked around the foreign body until the latter was loosened; then a forceps was passed into the wound, still under the rays, and made to grasp the shell splinter which was then removed. The wound was packed with "bipp" gauze and healed rapidly.

Case 3. L. M.; admitted August 6, 1918; wounded July 20, by a bullet which entered the outside of left thigh just below the anterior superior spine, then passing through the bladder, lodged in the right side of the pelvis and was shown by the X-rays embedded in the bone under the iliopectineal line on a level with the acetabulum. Operation was performed on September 14, 1918. An incision was made from just inside the right anterior superior spine to the middle of Poupart's ligament, the muscles were divided and then the abdominal fascia, and by blunt dissection the incision was carried down to the pelvic brim, the iliac vessels being displaced inward. The operator donned the X-ray bonnet, and after some searching a hole in the bone was felt with a blunt dissector, under the iliopectineal ridge. Owing to this ridge it was necessary to work round an angle, and as it was the point of the bullet which presented in the hole it was found impossible to grasp it in a forceps in spite of repeated efforts. The operator therefore removed the bonnet, and with a gouge cut away the overhanging edge of bone. He then put on the bonnet and with the blunt dissector loosened the bullet and removed it in the grasp of a forceps. The wound was closed and healed quickly, and the patient left the hospital well, within a month of the operation.

Case 4. A. B.; soldier; had a revolver bullet lodged in the right foot between the anterior extremity of the os calcis, scaphoid, and astragalus. It had entered from the dorsum. The wound of entry was healed. By the help of X-ray plates taken in two positions an unsuccessful attempt had been made at another hospital to remove the bullet by lateral incisions on either border of the foot. Operation was performed on September 14, 1918. The internal incision, previously made, was opened up. The operator now put on the bonnet. The sole of the foot was placed flat on the table and a blunt dissector pushed in until the bullet was reached and loosened; here it was impossible, owing to the surrounding bone, to recognize the bullet by feel. The bullet was removed with the forceps.

Case 5. H. S.; a soldier; was hit by a small piece of shrapnel in the front of the middle of the right thigh. The wound was healed and an X-ray plate taken anteroposteriorly showed a foreign body a little to the outer side of the bone. An attempt was made to reach it by following the cicatricial track, but it failed. On October 8, 1918, he was anæsthetized on the X-ray examination table. Even with the bonnet on, it was difficult to see the foreign body owing to its minute size, but it was finally reached with a probe, loosened and then removed in the grasp of a forceps; it was situated close to the postero-external aspect of the femur and was only 1.5 millimeters in diameter.

Case 6. M. M.; admitted October 13, 1918; wounded July 23, 1918, by a shell splinter which entered in the left lumbar region and lodged in the left chest. By the X-rays the splinter was localized under the left fifth rib between the nipple and anterior axillary lines. There was no movement with respiration. An unsuccessful attempt had been made to remove it at another hospital. The foreign body was carefully localized by the screen on the operating table. A portion of the fifth rib was removed and the shell splinter 1.5 by 1.75 by .75 centimeters was at once seen lying in a small cavity outside the pleura. It was removed and the wound closed. In this case it was expected that it would be necessary to use the X-ray bonnet after the removal of the rib, but there was no need as the piece of metal was visible.

Case 7. L. R.: admitted October 2, 1918; wounded May 29, 1918. This soldier had been wounded in the left knee and the X-ray showed a small piece of shell embedded in the back of the internal condyle of the left femur. He himself demanded its removal. On October 16, 1918, an incision was made vertically over the posterior part of the inner side of the knee, and the internal condyle was exposed without opening the joint. The operator put on the X-ray bonnet and marked the point on the bone under which the foreign body lay. A small hole was made in the bone with a gouge and a blunt dissector pushed into the cancellous tissue. An attempt was made to reach the splinter but failed; then with the knee turned on its outer side, the operator wearing the bonnet worked a small curved gouge through the cancellous bone until the shell splinter was reached, when it was loosened and removed. The foreign body measured 3 by 2.5 by 1.5 millimeters.

Case 8. L. D.; admitted October 23, 1918; wounded July 18, by a bullet which entered the back of the left chest, close to the outer border of the scapula, smashing a rib; it was shown by the X-rays to be lying on the right side of the chest deep to the seventh rib, just external to

Fig. 5. Use of vibrator of M. Bergonié during operation.

Fig. 6. Operation under direct vision by X-rays with bonnet of Dessane covered by sterilized towel

its angle about 5 centimeters from the posterior skin surface. There was no movement of the bullet with respiration and it was hoped that it lay between the rib and the pleura. At the operation an incision was made along the course of the seventh rib, and 1.5 inches of it were removed, 2 inches from the angle. The operator donned the X-ray bonnet, and the bullet was plainly seen, but it could not be palpated or made to move by pressure in the wound. The operator removed the bonnet and incised the pleura. The lung was found to be adherent and a small incision was made in the altered lung tissue. The bonnet was again put on and a probe passed into the wound. At this moment the electric current failed, and on telephoning to the electric station it was found that there was a short circuit on the line which would take a couple of hours to repair. The operation was continued, therefore, without the rays, and by blunt dissection the wound in the lung tissue was carefully deepened and the bullet was found and removed from a depth of 4 centimeters. There was very little oozing of blood and the wound was "bipped" and closed. There was very slight hæmoptysis for the first 12 hours; the wound healed by first intention and the patient left the hospital a fortnight after the operation.

Case 9. J. B.; admitted October 4, 1918; wounded September 25, 1918, by shell splinter. This soldier showed a small foreign body deeply situated in the right axilla. A half inch incision was made, and under the screen a blunt dissector was pushed in until it was seen to be in contact with the piece of metal. Then a Kocher forceps was passed in and the steel splinter grasped and removed. The whole operation took only about 3 minutes, and the incision was closed by one Michel clip. Convalescence was completed in a week. Under ordinary methods, this would have required an extensive dissection of the axilla, as the foreign body was situated close to the vessels and the nerves of the brachial plexus.

Case 10. Admitted November 16, 1918; wounded July 29, 1918, by explosive bullet. This soldier had a comminuted fracture of the middle of the right tibia. On admission the fracture was unconsolidated and the X-ray showed numerous fragments of metal in the seat of the fracture. At the operation on November 29, 1918, the wound on the outside of the front of the leg was enlarged, and the hard bare ends of the upper and lower fragments exposed. A fair sized central sequestrum was removed. The operator put on the X-ray bonnet and three fairly large pieces of the mantle of the bullet were removed and three very small pieces of lead, all from the line of the fracture itself, with practically no disturbance to the bone ends, which were partially embedded in callus developing on the back of the bone. Some more sequestra were removed and the whole area cleaned with ether and "bipp" and packed with "bipp" gauze.

Case 11. J. F.; admitted September 27, 1918; wounded May 21, 1918, by splinter of aerial torpedo. This soldier had a healed wound to the right side of the second dorsal vertebra. On examination with the rays, a large shell splinter was seen between the last rib and the crest of the ilium on the right side. Distinct movement was felt under the vibrator.

Operation was performed on October 11, 1918. An oblique incision was made, as for a lumbar exploration of the kidney, between the last rib and the crest of the ilium, and the muscles were divided. The vibrator was then applied and a faint vibration could be felt deep to the anterior portion of the wound. By careful, blunt dissection the tissues were divided until a large piece of metal 2 by 1 by 1.5 centimeters was found in a small cavity. This was removed, the cavity cleaned with "bipp" and the wound sewed in layers. It appeared to be outside the kidney in the loose tissue behind the ascending colon. He had been advised at Paris not to undergo an operation for removal.

Case 12. M. M.; admitted July 2, 1918; wounded May 27, 1918, by bullet. This soldier was hit by a bullet just to the right of the second lumbar spine. The bullet lodged in the right side and could be seen by the X-rays, lying apparently under the last rib at a depth of 5 centimeters from the skin of the back. There was a distinct vibration felt under the vibrator. On July 3, 1918, an incision was made obliquely along the lower border of the eleventh rib, the muscles were divided, and the extraperitoneal space opened. A hard object was felt and was

shown by the vibrator to be the bullet. The fibrous capsule was divided and the bullet extracted. The cavity was "bipped" and the wound closed. This operation which had been advised against in Paris, was performed in less than 15 minutes without the aid of an assistant.

CASE 13. Twenty-seven minute fragments of grenade in left hand. The patient had been wounded in the left hand by a bursting grenade one month previously. All his wounds were cicatrized, but he complained of diffuse tenderness over the sides and front of the little and ring fingers at their bases, and over the hypothenar and thenar eminence. A roentgenogram showed these areas speckled with minute metallic fragments which gave no vibration with M. Bergonié's instrument. At operation all these were removed, one operator localizing them with the radioscope and using a needle as a pointer, the other using the knife and extracting the fragments. Except on the radial side of the little finger and at its base where two long incisions enabled us to reach 8 fragments, the foreign bodies were removed through quarter-inch cuts. So clear was the radioscopic picture that after the removal of a fragment, it was possible to distinguish the faint shadow of metallic staining which marked the position it had occupied. Twenty-seven small curled scales of metal were rapidly extracted. Eleven of these scales were each a little larger than a pin's head; the remaining 16 were more minute. The wounds healed normally and tenderness completely disappeared from the hand. This operation if attempted by any other than the direct radioscopic method would probably have been incomplete, or if complete, mutilating.

CASE 14. Shell splinters in the tibia. The patient had been wounded 2 months previously by a shell. The wound at the lower end of the right tibia was healed, but the patient had a fear of latent sepsis, and desired removal of the splinters. The radioscope showed that 3 of the fragments were included in the tibia just deep to its inner aspect. There was also a larger fragment in the soft tissues between the external malleolus and the astragalus. This was removed first, a probe, after incision, being thrust into contact with it under the guidance of the radioscope. Through a second short incision a small opening in the tibia was then made with a gouge, and 3 projectiles, the largest half an inch in length, were removed from a cavity a fourth of an inch deep to the inner surface of the bone. This extraction was easily and rapidly effected with the aid of the radioscope, in spite of the fact that the fragments were embedded in the wall of the cavity and although the opening in the bone was so small as to prevent direct observation of their position. The two wounds which were "bipped" and sutured in layers, healed normally, and the patient was discharged 14 days after operation.

CASE 15. Three shell splinters in the os calcis. The patient presented a cicatrized wound in the left foot which had been received 8 weeks previously but he desired the removal of the metal fragments. One projectile was observed with the radioscope and a 1.5 inch incision parallel to the long axis of the os calcis was made over its outer side. The bone was opened with a gouge and the projectile, a quarter inch cube was found encrusted in the wall of a small cavity at a depth of half an inch from the bone-surface. It was removed, and two other scale-like fragments, each the size of a pin's head, were seen also to be fixed in the cavity. These were easily dislodged, but were less easily extracted, both on account of their minuteness and because of the tendency of their shadows to become linear when they were moved and so to vanish in the shadow of the bone. These two fragments were taken out with a curette. The wound was "bipped" and sutured in layers. Cicatrization was normal.

NOTE.—In these two cases of intra-osseous projectiles, Cases 14 and 15, one operator made the incision and opened the bone; the other, wearing the radioscopic bonnet, localized the projectiles and extracted them.

CASE 16. The patient had been wounded about 8 weeks previously, by a shell fragment and presented a small scar in the lower dorsal region of the left side. A preliminary examination revealed a projectile in the posterior part of the left hemi-thorax at the level of the eighth rib, near its angle. At operation the shadow of the projectile was seen with the radioscope, at first vaguely owing to weakness of current, but presently a clear shadow appeared and a 3-inch vertical incision was made 3 inches from the spines of the vertebra.

Under radioscopic control the thickened and adherent pleura was incised vertically, between the eighth and ninth ribs, and a closed forceps pushed gently through the adherent lung in contact with the projectile which was extracted with scarcely any hæmorrhage from the fibrotic lung-tissue in which it lay. The wound was then "bipped" and sutured in layers. Except for the fact that the patient's sputum on the evening of operation was slightly tinged with blood, recovery was uneventful, and he was discharged 14 days afterward.

CASE 17. Shell fragment in a bilocular intraperitoneal abscess. The patient had been wounded 6 weeks previous to admission. He presented a small scar on the right loin, 1.5 inches below the middle of the twelfth rib, and a roentgenograph sent with him showed a projectile in this region. He was very thin. He had loss of appetite, diarrhœa, abdominal pain of a colic-like nature, epigastric tenderness, and a fluctuating temperature. He did not vomit. The upper abdomen was resistant rather than rigid and gave no dullness on percussion.

At operation under radioscopic control, a 2.5 inch incision was made parallel to the twelfth rib. This incision was carefully deepened and a closed sinus forceps was passed into contact with the projectile at a depth of 2.5 inches from the surface. At the moment of contact there was an escape of over an ounce of pus, and the shadow of the projectile moved suddenly across the radioscopic screen and was covered for a moment by the shadow of the twelfth rib.

Then, as suddenly, it reappeared in the unshadowed field. In attempting to regain contact with it, the forceps opened a second and much larger abscess cavity from which 2 pints of odorless pus escaped and once more the projectile-shadow was seen to move. The smaller cavity was the hepatorenal pouch, and the finger introduced between the right kidney and the liver could be passed through an aperture into the larger cavity beyond. This was probably either the distended lesser sac or the subhepatic space. By careful manipulation of a long sinus forceps the observer with the radioscope was able to regain contact with the projectile in the larger cavity at a depth of 6 inches from the lumbar surface and at a point which must have been close to the anterior abdominal wall. The projectile was then extracted. It was the size of a finger-nail and one-eighth of an inch in thickness.

The bilocular cavity was washed out with 3 liters of Dakin's solution and then packed with "bipped" gauze for 48 hours. The patient recovered rapidly but his stay in hospital was prolonged by the persistence of a sinus leading to an intramuscular pocket in the abdominal wall. This pocket was curetted and "bipped," and the patient was discharged 2 months after the first intervention.

Without direct observation of its shadow during the operation, the innocuous extraction of this elusive projectile through a small incision would have been almost a miracle.

EDITORIAL

NECESSARY INCREASE IN THE SUBSCRIPTION PRICE OF THIS JOURNAL

THE burden of increasing costs in the publication of this journal has become so great that we are now obliged to ask our subscribers to approve an increased subscription rate in order to insure its continuation on the same plane of excellence as in the past.

SURGERY, GYNECOLOGY AND OBSTETRICS was founded fifteen years ago by a group of surgeons, with the idea that there was need for a high class special journal which should cover the broad field of surgery in all its specialties. They had no idea of making it a money-making enterprise, and its earnings from year to year have been utilized to publish a better and a larger journal. It has achieved a leading place among the special journals of the world and today has a paid subscription list in excess of 11,500, a circulation far greater than that of any other similar publication.

Since the outbreak of the European war in 1914 and particularly since the entry of the United States into the war, manufacturing costs have increased enormously. Printing costs have more than doubled, being at this date approximately 107 per cent more than in 1914. The cost of paper has trebled. Ten tons per month are required, costing now from 15 to 22½ cents per pound as compared with pre-war prices of 4½ to 7 cents. Likewise, all other costs have greatly increased during the same period, and the point has been reached where the expenses of publishing this journal exceed the gross receipts from subscriptions and advertising. In addition, still further increases in the cost of both paper and printing are to be met.

In many respects SURGERY, GYNECOLOGY AND OBSTETRICS differs from most other publications. In the first place, it is more largely dependent upon subscriptions than the average journal, as four-fifths of the money that goes to meet publication expenses is derived from subscriptions and only one-fifth from advertising. Secondly, the publication of the ABSTRACT, which comprises one-half the complete edition, entails a large expenditure for translating, abstracting, and editing—an expense unusual to most medical journals. Another unusually heavy item of expense is due to the number and quality of the illustrations used—in respect to which we feel any reduction would seriously impair the value of our publication.

Effective July 1, 1920, therefore, the subscription price of the complete edition, which includes the INTERNATIONAL ABSTRACT OF SURGERY, will be $12.00 per annum to subscribers residing in the United States, Canada, and all points where domestic postage rates apply. To subscribers residing in foreign countries the subscription price will be $14.00. For the special cloth edition the rate will be increased proportionately.

Franklin H. Martin

MANAGING EDITOR.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING JANUARY 16, 1920, WITH DR. A. H. CURTIS, PRESIDENT, PRESIDING

OVARIAN CYST AND TWISTED PEDICLE IN CHILD OF 12

DR. MARK GOLDSTINE: This case is only important from the standpoint of the age of the patient. The little girl was 12 years and 9 months old, and never menstruated apparently, although a healthy child. She was admitted to Wesley Memorial Hospital on the first of October, 1919. At that time she had a temperature of 99.8°, with a pulse of 120, and a leucocyte count of 27,000. Two months before this she had some attack which began with a sharp pain in the right lower abdomen which lasted two hours. The physician at that time made no diagnosis. On September 29, she had a recurrence of pain in the same region which did not appear to become worse. On admission to the hospital she had what we thought was a typical ruptured appendix. I operated upon her for a ruptured appendix and found an innocent appendix, and on exploring further I found an ovarian cyst with twisted pedicle, the pedicle being twisted two or three times from left to right.

ANURIA FOLLOWING BLOOD TRANSFUSION

DR. ARTHUR H. CURTIS: I would like to report a case which is now in my service at St. Luke's Hospital. The patient, a young woman, recently married, came from Michigan two weeks ago. She had a marked anæmia, with about 30 per cent hæmoglobin, due to bleeding from a uterine fibroid. Her condition was so precarious that it was impossible to operate, and so serious that it seemed advisable to give her blood transfusion. Under favorable conditions we performed transfusion by the citrate method which progressed very favorably. It was done in a manner similar to other transfusions by the same method. The patient developed anuria immediately following transfusion, although the blood of the donor was tested with that of the patient and apparently was perfectly compatible. The patient developed some hæmaturia, had a chill, with an extremely rapid pulse, and a great deal of pain in the back immediately after transfusion, followed by the anuria which I have mentioned. During the 24 hours, as I recall it, following her transfusion, there was passed only 1 ounce of urine. In the succeeding 3 days the patient passed respectively 3 ounces of urine, 1 ounce of urine, and 2 ounces of urine. The urine showed only a trace of albumin, an occasional cast; but it was normal in other respects. The blood urea was enormously high, amounting to 100 milligrams per hundred cubic centimeters. The patient is now gradually recovering. I present a description of this case with the hope that you may have some explanation for the anuria which followed transfusion. It seems to me very likely that it was the result of the transfusion, and not the result of the anæmia.

THE POSTMATURE CHILD

DR. CHARLES B. REED read a paper on the postmature child. (See page 580.)

DISCUSSION

DR. CAREY CULBERTSON: I have always felt it was quite as difficult to save a postmature child as a premature one, if indeed it is not more difficult. A premature child is far enough advanced in its physiology to take and assimilate food and stands a good chance of thriving in an incubator. A postmature child is lost in labor as the result of difficulties in delivery. The postmature child is definitely an overgrown child, and if too large to pass through the pelvis without considerable assistance can be delivered safely by cæsarean section alone. In this respect only is the matter of saving it a simple one.

In my experience this is one of the real problems at the end of pregnancy that requires judgment; and under certain circumstances we are not always sure of that judgment, as has been brought out by Dr. Reed in his closing statement. It is a question which I think has been ably and properly presented before the society at this time, a question which confronts every one of us who practices obstetrics. I think every man who has had any considerable experience has had one or more of these cases of definite postmaturity, where the problem of delivery has become increasingly serious as the case has gone further into labor, resulting not only in extensive impairment of the maternal structures, but as well in the damage that is done to the child, often fatal. For this reason there is much to say in favor of Dr. Reed's position with respect to arbitrary

induction of labor at term where maturity of the child is unquestioned.

Dr. Charles S. Bacon: I have been impressed with the advocacy of interference by Dr. Reed in these cases, but not exactly convinced. I know that there have been some statistics showing the increased dangers of large and postmature children, but I do not know that they are as numerous as may be desirable to settle this question more definitely. Suppose all of us in our work kept careful records of the children that may be called postmature, with the results of noninterference, and suppose those results compared very favorably with those produced by interference; it might help a little to enable us to agree.

Judging from the date of conception and the date of fœtal movements, and so on, I have had a number of cases that have gone from 300 to 320 days and have had fairly normal spontaneous delivery, and my own limited experience does not make me feel the anxiety that I should have were there more statistics to rely on. The tendency, I think, in recent years has been to rely upon noninterference in contracted pelves — at least, in primiparæ, and it seems lacking in the other direction where there is interference simply because there is some increase in the size and weight of the child.

Dr. Joseph L. Baer: I should like to ask Dr. Reed whether in measuring the height of the fundus in centimeters he uses the hair-line measurement or the circle; in other words, whether it is a caliper measurement or tape applied to the abdomen and following the curve of the abdomen. I find 33 to be a distinctly short measurement for a full-term uterus, and 35 a reasonable average. I am interested to know the method the essayist uses in obtaining that measurement.

I am also interested to know whether Dr. Reed is prepared to give us an accurate statement of the antepartum and postpartum comparisons of measurements of the head. Personally, I have relied on the relation of the head to the pelvic inlet at the time of supposed maturity. In other words, if the patient reaches term and does not go into labor, I subject her to a bimanual examination and directly force the head toward the pelvic inlet and into it. If there is no evident maladjustment, I wait for adjustment. If the head meets with bony resistance, I would seriously think of interference regardless of the measurements of the head intra-uterine or at the height of the fundus.

Dr. Theodore J. Doederlein: I would like to ask Dr. Reed what results he had with percentage diet.

Dr. Reed (closing): In regard to Dr. Doederlein's question concerning percentage diet, I have had three cases on a percentage diet which I thought were satisfactory, but they dropped out of sight before I could finish.

In regard to Dr. Baer's question of measurements I use a tape which passes from the upper border of the symphysis over the rotundity of the uterus and into the sulcus behind the fundus, but not clear down. I carry the tape to the edge of the finger, so that the finger makes the edge of the fundus which gives me the length.

Dr. Baer asked in regard to measurements of the fœtal head. The Muller manœuver he describes I used for a number of years, but I found it so painful unless an anæsthetic were given that I have not used it much of late. In regard to the measurements, I have omitted them here, I have given them before.

TYPES OF PELVIC INFECTION

Dr. Theodore J. Doederlein read a paper entitled "Types of Pelvic Infection." (See p. 599.)

DISCUSSION

Dr. Emil Ries: The most interesting part of the paper of Dr. Doederlein to me was the reference to survival of infections in the female sexual tract.

During the recent war a good many observations were published where surgeons operated on extremities which had apparently recovered from infected injuries and required some plastic work, and where immediately after the operation infection flared up, sometimes with serious results.

It would, of course, clinch the matter if at time of operation streptococci had been found in these tubes, and Dr. Doederlein did not mention that. As long as streptococci have not been found in the organs removed during operation, there is always the possibility of streptococci having been introduced during the course of operation. In the best regulated clinics it has happened that after an apparently simple operation acute streptococcic infection has killed the patient. I remember that a couple of years ago I was in an eastern clinic, where the chief of the clinic was very much upset because after a simple operation for an ordinary chronic salpingitis his patient was dying from a streptococcus peritonitis. He discussed very earnestly the possibility of these streptococci having been in the tubes for years, but could not console himself with that solace, especially as he had examined the tubes bacteriologically, as was the habit in that clinic, and there was nothing found in the tube. He had assumed that the streptococci by some misfortune were introduced in the course of the operation. I am very much interested in that question because such an observation, if clinched by the finding of streptococci in the organs, will be very, very important.

Dr. Carey Culbertson: Dr. Doederlein's paper brings up the old subject of classification of pelvic infection, one I am particularly interested in, because I desire a modern classification of pelvic infections for the purpose of teaching. If we read the textbooks, they still give us the same old clinical groups which do not conform to our modern ideas of infection or of bacteriology.

The two main groups he brought out in detail, that is, the pathology following puerperal infection.

and that following gonorrhœal infection, and he mentioned that pelvic peritonitis develops from the appendix. But there is a group of infections confined to the pelvis wherein the pathology is not characteristic of these types, where the uterus and appendages apparently are not primarily diseased, but where there has been peritonitis about the uterus and appendages, where there are light adhesions, and that too, with no history of puerperal infection, and in some instances no history, even of pregnancy. Likewise there is no history or evidence of gonorrhœal infection. In some cases there is a history of pregnancy or of abortion, but none of infection following abortion. In my mind it is virtually impossible to empty the uterus prematurely, that is, artificially, without some peritoneal reaction sufficient to produce some adhesions. In spontaneous or incomplete abortion such infection is certain to occur. Does this express a light reaction to streptococcus in staphylococcus invasion? On the other hand, where there is no preceding gonorrhœa or puerperal history and we find similar or identical conditions, what is the explanation? Is there such a thing as focal infection producing reaction in the pelvis, infections of the pelvic peritoneum due to some distant infective focus, such as the nasal sinuses, the tonsils, or the teeth?

I am interested in that type of peritonitis that involves the closure of the fimbriæ of the tubes, producing hydrosalpinx, or that kinks the tube by light adhesions, distorting or obstructing its lumen only. In other words, what about the etiology of the so-called catarrhal salpingitis.

Dr. Mark Goldstine: About 4 years ago at Wesley Hospital, Dr. Kanavel and I had a very harrowing experience. He had some very violent infections in I think two or three abdominal cases. Two of them were fatal. These came at the end of an interne service. I got the same interne next, and proceeded to get two very violent infections, one after a simple operation. A violent streptococcus peritonitis developed, followed by death of the patient, and in another, after a hysterectomy, where the patient was violently ill. We decided to take that interne off of the service. We did so. We examined the secretions from the nose of the interne and found that the organisms corresponded with those found in our own cases.

Dr. Doederlein (closing): In answer to Dr. Ries, I will say that the ordinary technique was used, and it is not very likely that such virulent streptococci were introduced during the operation. The tube was not examined for streptococci.

I had another case of puerperal infection, and two years afterward the woman had another cyst which ruptured. She had an enormous peritoneal reaction, but she recovered from operation. She became pregnant, was confined without reaction, recovered, became pregnant again, and had another cyst. This case was very interesting. I was very conservative. It was a torsion cyst and was located above the pubes. I opened it and found the streptococcus. I left the wound open, and drained it. There was such intracystic pressure when I opened the cyst that the contents squirted up above my head. The odor was strong. This attack came about 3 years after the primary abortion. The patient has had a baby since operation.

In answer to Dr. Culbertson, I will say that focal infection occupies a very prominent place in the minds of practitioners today, and although a great deal has been done in investigating the subject I have found nothing in the literature which would answer Dr. Culbertson's queries.

SHORT UMBILICAL CORD

Dr. Charles S. Bacon read a paper on "Short Umbilical Cord." (See p. 597.)

DISCUSSION

Dr. Eugene Cary: I had a patient recently, a para-II, who is still in the hospital and whom I delivered of an eight and three-quarter pound child normally, in which the child, as the previous one had been, was breech for a considerable time, but during the last month of life *in utero* the child was very active and performed spontaneous version, so that we had a vertex. In that time the child evidently had rolled over twice because the cord was around the neck and made a loop in the third roll, so that it crawled through the loop into the cord and tied itself in a true knot. The cord luckily was long enough. The child was delivered. It came down snugly without undoing the coils around its neck, and the child did not suffer from asphyxia. If the cord had been 5 or 10 centimeters shorter, it would have been sufficiently snug to have stopped circulation, and the child would have had died in the last few hours before delivery.

AMERICAN COLLEGE OF SURGEONS

ORGANIZATION OF STATE AND PROVINCIAL CLINICAL SECTIONS

IN accordance with a resolution adopted by the Board of Regents of the American College of Surgeons, providing for the organization of clinical meetings in the several states of the United States and provinces of Canada, the Secretary-General has visited the following states, meeting with the Congressional Representatives at the capital or one of the large cities in each state:

Louisiana	Washington	Missouri
Texas	Idaho	Tennessee
Arizona	Montana	Kentucky
California	Utah	Ohio
Oregon	Colorado	Indiana

In each of the above states the organization of a clinical section was effected, and an Executive Committee elected to carry out the details of the project.

OUTLINE OF ORGANIZATION

1. OBJECT: The organization of state and provincial clinical sections along the lines of the annual Clinical Congresses of the College, each section to hold an annual meeting within the state or province at some convenient time during the year.

2. FORM OF ORGANIZATION: One representative for each Congressional District within the state, and two senatorial representatives at large, each to be elected by the Fellows of the state for a term of two years, one-half of the number to be elected each year. This body to correspond in the state to the Board of Governors of the College.

An Executive Committee for each state, composed of from three to five Fellows, to be elected annually by the representatives of each state. This Committee to correspond to the Board of Regents of the College and to be the supreme executive body in the state. The Executive Committee will make all arrangements for annual meetings, appoint the Committees on Arrangements, and select the meeting place, headquarters, and speakers.

In Canada similar organizations will be effected in each province.

3. MEMBERSHIP: To comprise Fellows of the College and invited guests, the latter to include candidates approved ethically for fellowship in the College by the State Credentials Committee, and to include also internists, pathologists, roentgenologists, sanitarians, and other medical men of influence.

4. PROGRAM: Clinics and clinical demonstrations to be conducted during the mornings by Fellows of the College, and invited associates, of the city in which the meeting is held; afternoon meetings for the laity, to be addressed by invited laymen and surgeons; scientific papers to be presented at evening meetings by local surgeons of prominence or by invited guests from outside the state or province.

In the conduct of these sectional clinical meetings it is the purpose to adhere as closely as possible to the plans which have been universally approved by surgeons who have attended the national Clinical Congresses which have been held in the large cities of the United States during the past ten years.

Close co-operation will be maintained between the state sections and the central executive office of the College, in order that the central organization, through its Board of Regents, may aid in developing the annual sectional clinical meetings.

Following is a list of the Executive Committees and Congressional Representatives elected in the states already organized:

LOUISIANA

EXECUTIVE COMMITTEE
Chairman, Frederick W. Parham, New Orleans
Secretary, Lucian H. Landry, New Orleans
Counselor, Alfred P. Crain, Shreveport

REPRESENTATIVES, Term expiring 1920
Senatorial, William Kohlmann, New Orleans
2nd District, Russell E. Stone, New Orleans
4th " Louis Abramson, Shreveport
6th " Robert Christie Kemp, Baton Rouge
8th " John Luther Wilson, Alexandria

Term expiring 1921
Senatorial, Rudolph Matas, New Orleans
1st District, S. M. D. Clark, New Orleans
3rd " Lewis B. Crawford, Patterson
5th " Archibald B. Nelson, Shreveport
7th " John Greene Martin, Lake Charles

TEXAS

EXECUTIVE COMMITTEE
Chairman, Bacon Saunders, Fort Worth
Secretary, Francis M. Hicks, San Antonio
Counselor, Witten B. Russ, San Antonio

REPRESENTATIVES, Term expiring 1920
Senatorial, Francis M. Hicks, San Antonio
2nd District, George H. Lee, Galveston
4th " E. J. Neathery, Sherman
6th " Andrew B. Small, Dallas
8th " James A. Hill, Houston
10th " Joseph Gilbert, Austin
12th " Bacon Saunders, Fort Worth
14th " Frank Paschal, San Antonio
16th " W. Launcelot Brown, El Paso
At Large, Arthur C. Scott, Temple

Term expiring 1921
Senatorial, John T. Moore, Houston
1st District, Lorenzo P. McCuistion, Paris
3rd " Elbert Dunlap, Dallas
5th " Harold M. Doolittle, Dallas
7th " James E. Thompson, Galveston
9th " John W. Burns, Cuero
11th " Kenneth H. Aynesworth, Waco
13th " Jacob E. Gilcreest, Gainesville
15th " Witten B. Russ, San Antonio
At Large, Edward H. Cary, Dallas

ARIZONA

EXECUTIVE COMMITTEE
Chairman, Winfred Wylie, Phoenix
Secretary, William A. Holt, Globe
Counselor, Roderick D. Kennedy, Globe

REPRESENTATIVES, Term expiring 1920
Senatorial, Roderick D. Kennedy, Globe
At Large, George E. Dodge, Tucson

Term expiring 1921
Senatorial, Frederick T. Wright, Douglas
At Large, Winfred Wylie, Phoenix

CALIFORNIA

EXECUTIVE COMMITTEE
Chairman, Henry H. Sherk, Pasadena
Secretary, D. C. Strong, San Bernardino
Counselors, Stanley Stillman, San Francisco
Wallace Irving Terry, San Francisco
Granville Mac Gowan, Los Angeles

REPRESENTATIVES, Term expiring 1920
Senatorial, Wallace Irving Terry, San Francisco
2nd District, Elisha Tolman Gould, Sonora
4th " Harry M. Sherman, San Francisco
6th " E. N. Ewer, Oakland
8th " Rexwald Brown, Santa Barbara
10th " M. L. Moore, Los Angeles
At Large, Stanley Stillman, San Francisco

Term expiring 1921
Senatorial, Edward T. Dillon, Los Angeles
1st District, Charles Clifford Falk, Eureka
3rd " Andrew M. Henderson, Sacramento
5th " Thomas W. Huntington, San Francisco
7th " Allen B. McConnell, Fresno
9th " Henry H. Sherk, Pasadena
11th " H. P. Newman, San Diego

OREGON

EXECUTIVE COMMITTEE
Chairman, Alpha E. Rockey, Portland
Secretary, Joseph A. Pettit, Portland
Counselor, George S. Whiteside, Portland

REPRESENTATIVES, Term expiring 1920
Senatorial, Ernest F. Tucker, Portland
2nd District, Alpha E. Rockey, Portland
4th " Andrew C. Smith, Portland

Term expiring 1921
Senatorial, Frank E. Boyden, Pendleton
1st District, Joseph A. Pettit, Portland
3rd " Robert C. Coffey, Portland

WASHINGTON

EXECUTIVE COMMITTEE
Chairman, Park Weed Willis, Seattle
Secretary, George W. Swift, Seattle
Counselor, William F. West, Everett

REPRESENTATIVES, Term expiring 1920
Senatorial, Ivan P. Balabanoff, Tacoma
2nd District, George Monroe Horton, Seattle
4th " Edmund S. West, Yakima
At Large, O. F. Lamson, Seattle

Term expiring 1921
Senatorial, William F. West, Everett
1st District, James B. Eagleson, Seattle
3rd " Horace J. Whitacre, Tacoma
5th " Charles M. Doland, Spokane

IDAHO

EXECUTIVE COMMITTEE
Chairman, E. E. Maxey, Boise
Secretary, William F. Howard, Pocatello
Counselor, Clifford M. Cline, Idaho Falls

REPRESENTATIVES, Term expiring 1920
Senatorial, E. E. Maxey, Boise
At Large, Clifford M. Cline, Idaho Falls

Term expiring 1921
Senatorial, Charles W. Shaff, Lewiston
At Large, Charles R. Mowery, Wallace

MONTANA

EXECUTIVE COMMITTEE
Chairman, T. Casey Witherspoon, Butte
Secretary, LeRoy Southmayd, Great Falls
Counselor, Rudolph Horsky, Helena

REPRESENTATIVES, Term expiring 1920
Senatorial, Fred F. Attix, Lewiston
At Large, Robert H. Beach, Glendive

Term expiring 1921
Senatorial, Thomas H. Murray, Butte
At Large, Alfred Karsted, Butte

UTAH

EXECUTIVE COMMITTEE
Chairman, Andrew J. Hosmer, Salt Lake City
Secretary, Frederick Stauffer, Salt Lake City
Counselor, J. W. Aird, Provo

REPRESENTATIVES, Term expiring 1920
Senatorial, Harry N. Mayo, Salt Lake City
2nd District, Andrew J. Hosmer, Salt Lake City

Term expiring 1921
Senatorial, Ralph T. Richards, Salt Lake City
1st District, Robert S. Joyce, Ogden

COLORADO

EXECUTIVE COMMITTEE
Chairman, Walter A. Jayne, Denver
Secretary, Oscar M. Shere, Denver
Counselor, Alexander C. Magruder, Colorado Springs

REPRESENTATIVES, Term expiring 1920
Senatorial, Horace G. Wetherill, Denver
2nd District, L. H. McKinnie, Colorado Springs
4th " Knud Hanson, Grand Junction

Term expiring 1921
Senatorial, Edward Jackson, Denver
1st District, Leonard Freeman, Denver
3rd " William T. H. Baker, Pueblo

MISSOURI

EXECUTIVE COMMITTEE
Chairman, Harvey G. Mudd, St. Louis
Secretary, William H. Luedde, St. Louis
Counselor, Jabez N. Jackson, Kansas City

REPRESENTATIVES, Term expiring 1920
Senatorial, Jabez N. Jackson, Kansas City
2nd District, Richard F. Cook, Carrollton
4th " Jacob Geiger, St. Joseph
6th " Henry Eagle Thomason, Kansas City
8th " Guy Lincoln Noyes, Columbia
10th " George Gellhorn, St. Louis
12th " William H. Luedde, St. Louis
14th " Major G. Seelig, St. Louis
16th " E. F. Yancey, Sedalia

Term expiring 1921
Senatorial, Paul Y. Tupper, St. Louis
1st District, Josiah G. Moore, Mexico
3rd " Daniel Morton, St. Joseph
5th " William J. Frick, Kansas City
7th " Roche W. Hogeboom, Springfield
9th " Frank Joseph Tainter, St. Charles
11th " Harvey G. Mudd, St. Louis
13th " Cyrus E. Burford, St. Louis
15th " Jackson B. Taulbee, Joplin

TENNESSEE

EXECUTIVE COMMITTEE
Chairman, W. A. Bryan, Nashville
Secretary, William D. Haggard, Nashville
Counselor, John M. Maury, Memphis

REPRESENTATIVES, Term expiring 1920
Senatorial, Duncan Eve, Sr., Nashville
2nd District, Albert G. Kern, Knoxville
4th " Rufus E. Fort, Nashville
6th " W. A. Bryan, Nashville
8th " Jere L. Crook, Jackson
10th " Edward C. Ellett, Memphis

Term expiring 1921
Senatorial, Eugene M. Holder, Memphis
1st District, Claude P. Fox, Greenville
3rd " George M. Ellis, Chattanooga
5th " Edward D. Newell, Chattanooga
7th " William D. Haggard, Nashville
9th " John M. Maury, Memphis

KENTUCKY

EXECUTIVE COMMITTEE
Chairman, Lewis S. McMurtry, Louisville
Secretary, Charles W. Hibbitt, Louisville
Counselor, David Barrow, Lexington

REPRESENTATIVES, Term expiring 1920
Senatorial, Arthur T. McCormack, Louisville
2nd District, Daniel M. Griffith, Owensboro
4th " Robert C. McChord, Lebanon
6th " Robert W. Bledsoe, Covington
8th " John Rice Cowan, Danville
10th " Frank Thomas Fort, Louisville
At Large, Henry Horace Grant, Louisville

Term expiring 1921
Senatorial, Bernard Asman, Louisville
1st District, Frank Boyd, Paducah
3rd " John Henry Blackburn, Bowling Green
5th " J. Garland Sherrill, Louisville
7th " David Barrow, Lexington
9th " Joseph A. Stucky, Lexington
11th " John D. Jackson, Danville

OHIO

EXECUTIVE COMMITTEE
Chairman, Charles S. Hamilton, Columbus
Secretary, J. Edward Pirrung, Cincinnati
Counselor, Walter H. Snyder, Toledo

REPRESENTATIVES, Term expiring 1920
Senatorial, J. Edward Pirrung, Cincinnati
2nd District, Joseph Arda Hall, Cincinnati
4th " Harry S. Noble, St. Marys
6th " James William Fitch, Portsmouth
8th " C. E. Sawyer, Marion
10th " Dan Feurt Gray, Ironton
12th " James F. Baldwin, Columbus
14th " Roy H. McKay, Akron
16th " Logan B. Zintsmaster, Massillon
18th " Henry K. Yaggi, Salem
20th " William E. Lower, Cleveland
22nd " Daniel W. Shumaker, Dover

Term expiring 1921
Senatorial, Benjamin R. McClellan, Xenia
1st District, J. Hadley Caldwell, Cincinnati
3rd " L. G. Bowers, Dayton
5th " Charles W. Moots, Toledo
7th " Charles L. Minor, Springfield
9th " George M. Todd, Toledo
11th " Charles S. Hamilton, Columbus
13th " Charles Graefe, Sandusky
15th " Henry Thomas Sutton, Zanesville
17th " Wilson M. McClellan, Ashland
19th " James A. Sherbondy, Youngstown
21st " James Craven Wood, Cleveland

INDIANA

EXECUTIVE COMMITTEE
Chairman, Miles F. Porter, Fort Wayne
Secretary, Stanley A. Clark, South Bend
Counselor, James Y. Welborn, Evansville

REPRESENTATIVES, Term expiring 1920
Senatorial, Edwin Walker, Evansville
2nd District, Charles E. Barnett, Fort Wayne
4th " Alfred P. Roope, Columbus
6th " Charles Marvel, Richmond
8th " Maynard Alvernise Austin, Anderson
10th " Richard B. Wetherill, LaFayette
12th " Luzerne H. Cook, Bluffton
At Large Miles F. Porter, Fort Wayne

Term expiring 1921
Senatorial Joseph Rilus Eastman, Indianapolis
1st District, James Y. Welborn, Evansville
3rd " John Paul Salb, Jasper
5th " Spencer M. Rice, Terre Haute
7th " John H. Oliver, Indianapolis
9th " Paul J. Barcus, Crawfordsville
11th " Edward H. Griswold, Peru
13th " Stanley A. Clark, South Bend